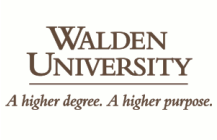

2016

Effective Instructional Strategies to Support Struggling Elementary School Math Students

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COLLEGE OF EDUCATION

This is to certify that the doctoral study by

Tianay Perrault

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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2016

Abstract

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by

Tianay Perrault

MEd, Kennesaw State University, 2010

BS, Rochester Institute of Technology, 2004

Doctoral Study Submitted in Partial Fulfillment

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Doctor of Education

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October 2016

Abstract

In a Northern California elementary school, school personnel were concerned that the math proficiency levels were low for 2011-2014 for low-Social Economic Status, SES, students and math teachers were not using the math professional development strategies provided nor consistently implementing the new math curriculum adopted by the district to support Common Core, CC, state standards. The purpose of this qualitative research study was to explore teacher perceptions regarding the math instruction related to students' performance. Vygotsky's social development theory served as the conceptual framework for this study. The study included interview data from 10 elementary teachers purposefully selected from Grades 2 through 5 who were known to meet the selection criteria of being a math teacher with 2 or more years of experience working with low SES students. Data from interviews, and archival documents were analyzed using inductive analyses and were analytically coded. The results of the analysis showed that the teachers wanted quality professional development that would prepare them to effectively teach math to struggling low-SES students. The identified themes were strategies teachers used to support low-SES students, instructional resources, effectiveness of professional development, and additional factors affecting low-SES students. Thus, the resulting project, *Guiding Struggling Math Students Toward Success* PD, provides math strategies for working with low-SES students and implementing the new math curriculum. This endeavor may contribute to positive social change by reforming PD opportunities to support teachers' practice and use of modifications during math instruction, ultimately increasing student performance in the elementary campus.

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Dedication

I dedicate this study to my husband, Jean-Pierre Perrault, and our children, Renee and Pierre, for their patience, love, support, and sacrifice so I could fulfill my dream. Thank you from the bottom of my heart.

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I wish to acknowledge my heartfelt gratitude to my husband and children for the sacrifices they endured so I could complete this doctoral journey. I would not have been able to continue without their unconditional love and support.

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I would also like to acknowledge some special women who served as my surrogate sisters on this journey and definitely kept me encouraged to finish strong as a cohort: Yolanda, Barbara, Cara, and Mary. Finally, a special thank you goes out to each of my participants: I appreciate the time you took to support my study and I will be forever grateful to the part you played in helping me reach this ambitious goal.

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Section 1: The Problem

Introduction

The students' math performance in the United States continues to fall behind those of other industrialized nations (Mullis, Martin, Gonzalez, & Chrostowski, 2004; Slavin & Lake, 2008). The inability of U.S. students to demonstrate mastery of basic skills that can be applied to problem solving strategies is alarming because these skills are a requirement for successful placement in the global labor force (Checkley, 2006; Saffer 1999). As a result, there are national and local concerns about the quality of math instruction American that U.S. students are currently receiving (Lubienski, 2007). As a result, the State of California has a renewed focus on rigorous instruction and adopted the Common Core State Standards for language arts and math.

There is a strong belief that the standards can help provide children the opportunity to attain a quality education that prepares them to be college-ready and globally competitive for future jobs (California Department of Education [CDE], 2013). One of the CDE's main goals is to ensure instruction is meeting the needs of diverse learners in the classroom and increasing the academic success for all students (CDE, 2013). In the past, the State of California had paid more attention to English language learners (ELLs), but other populations of students are not performing well, including those from low socioeconomic backgrounds (EdSource, 2011). It is important to use instructional strategies that support a variety of learners in order to promote student success for these diverse groups.

Success in mathematics is of particular significance because it leads to higher-paying jobs and can serve as a pathway for low-SES youth to improve their future socioeconomic status (Lubienski, 2007; Rothstein, 2004). The ability of students to learn early foundational academic skills has a positive impact on future performance (Duncan et al., 2007; Duncan & Magnuson, 2011; Jordan, Kaplan, Ramineni & Lucuniak, 2009). Furthermore, students who have low performance in the primary grades continue to struggle later, and those who have high performance early maintain that level of success in higher grades (Jordan et al., 2009). Because early math achievement provides the foundation for continued academic success and future economic growth, it is important for educators to understand strategies that ensure struggling students are achieving at high levels.

Background of the Study

The study took place at XYZ Elementary School (pseudonym) in northern California. At the time of this study, the school body was comprised of 640 elementary students and 40 staff members. Each grade level consisted of 4 cohorts of classes with the exception of second grade, which had 5 cohorts of classes. Each class had 27 to 31 students. The school population of students included 71% ELL students; 84% of its students received free or reduced-price lunch. The student body was 79% Hispanic, 9% Asian, 7% White, 2% African American, 2% American Indian, and 1% Filipino (CDE, 2012). The school staff consisted of 19 K-5 teachers, seven enrichment teachers, three para-educators, three special education teachers, four administrators, and one part-time counselor.

Definition of the Problem

At the time of this study, students at XYZ Elementary School in northern California were not performing well on state assessments. The California State Test (CST) is given to students in grades two through eleven. In the first testing year in 2011-2012, the focus school received an overall Academic Performance Index (API) score of 805 while the state average API was 814. However, in 2012-2013 the focus school's score dropped to an API score of 791, compared to the state average API was 810. A summary of the historical data on student performance levels of the math portion of the CST is shown in Table 1.

Table 1

History of CST Math Proficient and Advanced Performance

Group	2011-2012	2012-2013	2013-2014
School-wide Performance	63%	72%	64%
Low-SES Students	60%	69%	61%
Non-SES Students	82%	91%	83%

Note. From "School Accountability Report Card" by Rocketship Education, 2014.

Proportionally speaking, fewer low-SES students scored in the proficient or advanced category, compared to the rest of the school population.

As a result of the drop in API, the district began to focus on XYZ Elementary School's annual improvement plan. Another target was addressing the state adoption of the California Common Core State Standards (CCSS) in 2012; the district wanted to be

sure XYZ Elementary School was ready to align to the new standards and increase CST scores (Rocketship, 2012). Rote memorization was no longer the answer; instead, the focus changed to building students' conceptual knowledge of math, which supports knowledge retention (instructional coach, personal communication, 2014). The gap in practice sparked a national response for states to move toward national math standards called Common Core State Standards (CCSS). The mathematics framework as laid out by the CCSS Initiative emphasizes the following:

> The standards stress not only procedural skill but also conceptual understanding, to make sure students are learning and absorbing the critical information they need to succeed at higher levels rather than the current practices by which many students learn enough to get by on the next test, but forget it shortly thereafter, only to review again the following year. (Common Core Standards, 2011, p. 1)

These frameworks were designed to give students a clear understanding of mathematical content in their working memory. Through teaching the common core standards, teachers have the ability to improve students' conceptual mathematics knowledge and understanding, so they are more prepared with fewer gaps in their mathematical knowledge (Common Core, 2012).

Prior to the mandate to move toward CCSS, teachers at XYZ Elementary did not have a full math curriculum to implement during the math block. Teachers were given piecemeal sections of math curriculum to use and relied on their own ability to interpret the standards (principal, personal communication, 2014). The primary math focus of the teachers has been on rote memorization with a huge concentration on memorizing math

facts and algorithms to solve problems (fifth grade teacher, personal communication, 2014). Marilyn Burns' (2007) calendar math program was used as a resource, and pieces of everyday math were also used as resources for direct instruction. Teachers mostly relied on the California state standards to build their own lessons (principal, 2014, personal communication). Without a clear curriculum and a strong reliance on self-directed teacher planning, students may not have received consistent levels of rigorous math instruction.

During 2012-2013, the district began researching curriculums that could be used to support the new CCSS adoption, which was aligned with the movement from rote memorization practices to building stronger foundation particularly in number sense (instructional coach, personal communication, 2014). In 2013, Singapore Math was chosen as pilot curriculum at XYZ Elementary School. Singapore Math is based on conceptually teaching students math using the principals of concrete, pictorial, and abstract representations (CPA) to support student understanding of math relationships (Singapore Math, 2013). While many teachers voted for the new curriculum, some were not fully on board because there was a choice of math curriculums, which other teachers felt might be better suited to fit the needs of the students. The teacher majority vote landed on Singapore Math; therefore, it became the new curriculum adopted by the school (principal, personal communication, 2014).

Some teachers were concerned with the pilot season of the new program because it was rolled out K-5; whereas, in Singapore students begin learning this approach from the kindergarten foundational year and up. Having students immediately transition into

the Singapore Math program would mean some students would have gaps to fill as they transitioned from the traditional way of doing math to the new conceptual format. According to What Works Clearinghouse Intervention Report on Singapore Math, the program requires conceptual understanding and strategic thinking based on problem solving techniques, which is different from the way math is taught in the United States (WWC Intervention Report, 2015). Even though students did not have much exposure to doing the Singapore Math format, they were still encouraged to try the new approach with an emphasis on understanding the concepts versus getting everything right.

In addition, teachers had concerns about planning because there was little expertise with the conceptual teaching of math at the level of rigor of the CCSS and the Singapore Math curriculum. Teachers mostly used the standards to map out their instruction and created lesson plans based on their scope and sequence. The professional development provided to teachers included an overview of the CCSS and a basic introduction to Singapore Math during preservice summer training. Teachers and their coaches were left to grapple with how to roll out the new curriculum to the students. The district did not pay for additional professional development from the Singapore Math consultant outside what was provided during preservice training. Math teachers definitely acknowledged a lack of confidence with transitioning the students to not only the new math standards but also the newly adopted Singapore Math curriculum (third grade teacher, 2015, personal communication).

Rationale

Mathematics achievement data in the United States continues to show students from low-SES backgrounds perform lower than their affluent peers. Students with deficits in basic math skills are a concern across many elementary schools (Poncy, McCallum, & Schmitt, 2010). According to the U.S. Department of Education elementary school students in the United States in general have a lack of basic math skills, especially those from low-SES backgrounds (Institute of Education Sciences, 2010). The *National Assessment of Educational Progress* (2009) stated,

> By the end of fourth grade, African American, Latino, and poor students of all races are 2 years behind their White and Asian counterparts. By eighth grade, they have slipped 3 years behind. When they reach Grade 12, poor and minority students are approximately 4 years behind. This means that the average 17-year-old African American and Latino students are at the same academic level as 13-year-old White Students. (p. 1)

Students from low-SES backgrounds need to master math content in a way that allows them to remember and build upon concepts so they can compete with their affluent peers (Davies & Qudisat, 2015).

Low math achievement scores for students from low-SES backgrounds is an area of concern for citizens living in California. When addressing math achievement on national tests, this state had 33% of fourth graders and 28% of eighth graders achieve proficiency on the 2013 National Assessment of Educational Progress (NAEP, 2009).

Fourth graders ranked 46th in the nation, and eighth graders ranked 43rd in the nation in math on NAEP (EdSource, 2013).

Many California students are not performing well on the state assessments or internal benchmark assessments, whether measured at the local, district, or state level. A common measure of this is a school's Adequate Yearly Progress (AYP), "by which schools, districts, and states are held accountable for student performance under Title I of the No Child Left Behind Act of 2001 (NCLB)" (Education Week, 2011, Adequate Yearly Progress, para 1). In Table 2, the combined achievement percentages for proficient and advanced are demonstrated for the local, district, and state level.

Table 2

2013 AYP Combined Proficient and Advanced Performance Standards at the Local, District, and State Level

Performance Levels	School	District	State
Goal	89.5% (*n*=350)	89.1% (*n*=19,690)	89.1% (*n*=3,727,000)
SES Students	68.3% (*n*=310)	43.1% (*n*=10,429)	50.4% (*n*=2,258,412)

Note. From "Adequate Yearly Progress Report" by DataQuest.

The percentage of low-SES students who were proficient or advanced was 21% lower than non-low-SES students at the local level. The gap continues to increase at the district level, where the percentage of low-SES students at proficient or advanced was 46% lower

than their non-SES peers. At the state level the gap between SES students and non-SES students was 39%. Understanding the factors that contributed to these gaps will help determine how to best support low-SES students.

One factor in low achievement is the lack of teachers' ability to effectively teach conceptual math so that students will become equipped with the tools necessary to pass these assessments. Another factor is the lack of teacher efficacy toward teaching mathematics in the elementary grades because of the limited experiences of the students who do not possess the prerequisite skills. Through interviewing teachers, I gained a deeper understanding of the local gap in practice related to the mathematics achievement of low-SES students and discerned what instructional supports and techniques work best with students identified as low SES as well as what professional development has been provided to support this population of students. In addition to teacher interviews, I reviewed teachers' lesson plans and archival student achievement data.

The intent of this qualitative case study was to explore elementary teachers' perceptions of staff development, math instruction strategies, and modifications that support low-SES students' math instruction. By gaining a deeper understanding of teachers' beliefs, thoughts, and dispositions about how to teach low-SES students I was able to discern potential solutions to better support teachers developing their skills with teaching this population of students. The study followed the construct of Vygotsky's theory social development theory and the concept of supporting students' individual needs.

Definitions

The following terms are defined for the clarity of the study:

Adequate yearly progress (AYP): An accountability measure used by U.S. public schools, districts, and states to measure student performance; created by the No Child Left Behind Act (NCLB, 2001).

California State Test (CST): California's state-mandated test to determine student mastery of standards in reading, language arts, math, and science (CDE 2012).

Conceptual knowledge/understanding: Knowledge accrued through interpreting relationships between mathematical concepts and student knowledge of basic math computation (Arslan, 2010).

Procedural knowledge/understanding: Knowledge accrued through memorizing math operations with any understanding of essential principles (Arslan, 2010).

National Assessment of Educational Progress (NAEP): A national assessment for U.S. students on core subjects; based on representative samples from Grades 4, 8, and 12 (NCES, 2014).

Teacher self-efficacy: A teacher's belief in their talents and ability to support student learning (Calik, Sezgin, Kavgaci, & Cagatay, 2012).

Significance

According to the Equity and Excellence Commission (2013), the U.S. Department of Education is charged with addressing the factors that prevent students from obtaining equitable education. Currently, low-SES youth are a subgroup whose scores count toward the State of California's ability to meet AYP. It is important to study the academic

performance problems of low SES youth at the elementary level in order to where the instructional and achievement gaps first begin and how teachers can more effectively support struggling students. Addressing these concerns will help ensure that all students have the opportunity to receive appropriate math instruction.

At the time of this study, California teachers were already asked to differentiate instruction so that all students are successful (CDE, 2013). In this qualitative case study, I wanted to understand math teachers' perceptions and challenges with supporting struggling students and particularly those from low-SES backgrounds. I specifically chose to examine what strategies teachers use to support their low achieving students. Information gained from this study provided resources to create a professional development on instructional math strategies and effective techniques for instructing math students from low-SES backgrounds.

Primary Research Question

Although math supports used by classroom teachers for low-SES youths have been studied, there is an insufficient amount of literature that addresses what strategies teachers use in the classroom and their perceptions of how to successfully instruct this group of students. The gap in practice in the local district is due to the shift in state math standards to CCSS. The local district has not provided the PD for the conceptual math skill development for math teachers needed to support low-SES student math skill development.

Caref (2010) suggested external causes of low math achievement of students from low SES is related to the number of school days missed due to sickness, high mobility

rates, suspensions, lack of transportation, and lack of child care. The author also correlated these issues to concerns about poverty and racism based on student narratives on their math experiences (Caref, 2010). In addition, Hranac (2007) used student narratives to uncover themes related to why low-SES students struggled with math. The students shared a variety of factors including their own past experiences with math, teacher instruction style, whether they were able to receive teacher or parent support, and how they evaluated themselves as compared to their classmates (Hranac, 2007). Other studies describe professional development research to support teachers in becoming effective at teaching math with a heavy emphasis on preservice activities but do not include teacher perceptions of what works. Nonetheless, the rationale behind this qualitative study is to investigate and learn about teachers' perceptions on how to support struggling students in math. The following questions guided this research study:

1. What strategies do elementary teachers use to teach mathematics?
2. How do teachers modify instructional practices to support struggling students?
3. What instructional strategies do teachers perceive best support achievement of low SES identified students?
4. What instructional strategies do teachers perceive lead to underachievement of low-SES students?
5. How do teachers perceive the district and campus professional development has prepared them for teaching the math Common Core State Standards?

Review of the Literature

The sources cited in this literature review were chosen to provide context for the research questions proposed in this qualitative case study. I reviewed related literature addressing causes of low math achievement as well as examples of research-based strategies used to support struggling students. The literature review was organized into main themes, including: cognitive models, early predictors for math difficulty, alternative methods for teaching math, student motivation, knowledge transfer, and teacher influences.

This literature review was conducted using Walden University library's database. Electronic resources utilizing peer-reviewed articles were found. Academic Search Complete, ERIC, Education Research Complete, ProQuest, and Education from SAGE were the major sources used for the search. Search terms included *math instruction, improving math instruction, math teaching methods, low income students, struggling math students*, *conceptual knowledge, academic challenges*, *procedural knowledge*, and *low math achievement.* I also used information from the United States Department of Education website and California Department of Education website.

Theoretical Framework

The theoretical framework for this study was based on Vygotsky's (1978) social development theory. Social development theory embraces the idea that social learning precedes development and is the foundation for developing cognitive processes in children. Another key theme in the social development theory is the Zone of Proximal Development (ZPD), which is the distance between a student's ability to perform a task

under adult supervision or with peer support and their capacity to complete the task independently (Vygotsky, 1978). This theory supports the notion that students should not merely have a new concept introduced to them and then be expected to master it on their own instantaneously. Vygotsky, instead, advocated for providing students with support at their ZPD, which in turn plays a major role in students' cognitive development especially in relation to math concepts. According to Vygotsky (1978), if social interaction precedes development, then affording opportunities for students to interact with others regarding math will improve their mathematical concept development. This can also be true when introducing students to a new conceptual math format similar to how Singapore Math was adopted.

Cognitive Models and Conceptual Understanding

A concern associated with this study is finding out what makes students from low-SES backgrounds struggle with math and perform lower than their affluent peers especially on high-stakes test. With the focus of the math CCSS on students building a deep conceptual understanding, testing is no longer limited to obtaining the correct answer, but also to pushing students to explain their thinking (Strom, 2012). Cho, Bottge, Cohen, and Kim (2011) discussed the lack of strategies available to support struggling students develop cognitive models to be successful on the types of math questions asked on high-stakes test. Cho et al. found that students responded to enhanced anchored instruction. This type of instruction pushes teachers to provide small group instruction for students to test hypotheses, facilitate class discussions, and give students who needed extra support with direct skill practice. While current practices give struggling students

more time or modifications such as test items being read aloud, they do not allow students the chance to understand the concepts they are missing.

There are two conceptual learning perspectives that support this study. The first concept is based on Hiebert and Carpenter's (1992) procedural and conceptual understanding, which states that issues tend to occur when students do not have a connection to the logic behind a math procedure so they provide answers that are imprecise. Skemp's (1976) relational understanding concept states that student misconceptions are related to misusing math rules because they fail to make relational connections to the content. The solution within this perspective is to begin with conceptual understanding then moving into procedural understanding through problem-solving activities (Hiebert & Carpenter, 1992; Holmes, 2012; Skemp, 1976). Decreasing the number of rules taught and instead concentrating on the concepts supporting the rules is a better approach to instruction (Holmes, 2012). Teachers need to be aware if students are learning what is planned for and be able to adjust if necessary in order to ensure all students are mastering the content (Bartell, Webel, Bowen, & Dyson, 2013). Focusing on building tangible experiences with math concepts before teaching rules and procedural algorithms builds schema so students can overcome misconceptions.

However, developing teacher understanding of how to correctly use problem solving strategies to support student's misconception is important. Krawec, Huang, Montague, Kressler, and de Alba (2013) investigated current efforts to improve student problem solving by restructuring math instruction to move from rote memorization of procedures to focus on analyzing problems and building conceptual understanding. In

Krawec et al.'s study, middle school students with a learning disability could not efficiently solve word problems because they lacked strategies and tools to evaluate the use of strategies they did have (Krawec et al., 2013). The cognitive strategy instruction (CSI) supports students by providing a process in which students can apply effective problem solving strategies to ensure accuracy and success. CSI includes problem translation, problem integration, solution planning, and solution execution (Krawec et al., 2013). Using problem solving strategies provides students a systematic process to build reflection methods as they simultaneously develop math cognition.

One way to build deep conceptual understanding is to use problem-solving techniques that drive student practice in the areas of reasoning and explanation (Hachey, 2013). However, to focus on problem solving, teachers must understand additional factors that could potentially affect student problem solving ability. Blair, Knipe, and Gamson (2008) discussed a potential problem with student success in math suggesting it could be linked to an inability to effectively problem solve as a result of limited math knowledge. In this case, math proficiency is related to executive functioning (EF), which is defined by the authors as cognitive processing within a student's working memory. While many math errors can be caused by lack of student procedural or conceptual knowledge, Blair et al. stated that EF can help teachers understand why students can get one question correct and another incorrect when they require the same knowledge (Blair et al., 2008). Recognizing the underlying cause of student math errors in relation to levels of executive functioning allows individuals interacting with struggling students the opportunity to provide support targeted to their level of cognition.

Effectively supporting struggling math students requires an understanding of students' needs. For example, having a clear understanding of a student's background knowledge provides insight into where a teacher needs to start based on information gathered on what students already know (Sidney & Alibali, 2105). Heiman (2010) discussed the lack of achievement of urban students in mathematics where results of a national study conducted by the Council of the Great City Schools (2004) showed urban achievement was below the national average. The theoretical framework used by Heiman (2010) was based in cognitive psychology and behavioral learning theory. The author also referred to Bloom's (1968) theory of mastery learning through cumulative practice, providing students immediate feedback, personalized support, and positive reinforcement. Providing instruction through a behavioral approach provides students opportunities to gain higher levels of success because they can adjust their actions based on teacher feedback and support.

Early Predictors for Math Difficulty

Math difficulty for students does not develop overnight. Usually students miss important building blocks along the way (Sadler, 2009). Typically issues begin when students from low-income backgrounds enter kindergarten without as many mathematical experiences as their middle-income peers (Clements & Sarama, 2008; Jordan, Kaplan, Ramineni, & Locuniak, 2009; Sadler, 2009). Sadler (2009) also noted that the basis of mathematics at the early stages is through cardinality and conceptual understanding of counting. Sadler discovered those students who struggle with math in their early years also struggle with math later in life, and that these young preschool students typically

have difficulty with counting because the strategy used was ineffective. The solution is to blend the procedural knowledge of counting with problem solving and reasoning activities (HodnickCadez & Skrbec, 2011; Sadler, 2009; Seed, 2008). Supporting students with counting fluency early in the preschool years provides a foundation for later math skills.

Several studies have confirmed the importance of foundational knowledge and basic math skills. Sasanguie, Van den Bussche, and Reynvoet (2012) suggested that the student's lack of knowledge with basic number processing in early primary grades affected student math achievement. Identifying students with number processing issues early allows them to get into intervention and possibly eradicate the misconceptions that can prevent them for future success. Jordan, Kaplan, Ramineni, and Locuniak (2009) suggested that building foundational knowledge in kindergarten supported competency in future calculations experienced in first through third grade. According to Libertus, Feigenson, and Halberda (2011), basic number sense and math capability begins early in life and is carried out throughout a child's academic career. Therefore, it is important to provide students with a strong math foundation during the early elementary years so they are better equipped to handle more complex math concepts later.

Alternative Methods

Understanding how to best reach the variety of learners in a classroom can be difficult. However, there are different approaches to teaching and learning that math teachers can employ. Linder (2012) discussed effective ways to use whiteboard technology as well as five essential characteristics of elementary mathematic lessons. The

first essential is building a community of learners through collaboration to provide opportunities for students to engage in rich discussions. Another essential is ensuring students have time to make connections between math and real life applications. The third essential is allowing students to represent their thinking because it helps them build confidence in their approach and promotes their thinking to shift from concrete to abstract. Next, is using manipulatives as supports for students to represent their understanding and assists with problem solving. Finally, designing child-centered tasks gives them time to explore and expand their thinking by finding multiple ways to solve problems (Linder, 2012). Using the five essential characteristics ensures math lessons allow students to become thriving learners who are active participants in the instruction.

Likewise, Munakata and Vaidya (2012) suggested one way to increase creativity in math is to allow students to observe math in real life daily situations and represent those observations in creative visual ways. Students were asked to use cameras to capture photo proof and symbols of math in their lives. The teaching strategy permitted students to make connections between their lives and the math content they were learning. In addition to the photos, they were asked to create four multi-step math problems to accompany the photo as well as a poster to showcase their photo (Munakata, & Vaidya, 2012). Using creative performance tasks in the classroom allows teachers to think outside the box and bring innovation to their math curriculum.

Student Motivation

Jones, Vermette, and Jones (2012) found that student motivation and lack of interest played a role in low math achievement. To support struggling readers, the authors

referenced Ketterling-Geller et al. (2008) ideas of incorporating think aloud procedures to allow students to verbalize their ideas that solidified their conceptual understanding. Other ideas included providing students active roles in testing math concepts in various contexts and providing tools needed such as manipulatives to aid learning. Cooperative learning was also mentioned as an effective tool to support student learning because time on task was calculated at over 80% during group time and dropped to 58% during whole class instruction (Jones, Vermette, & Jones, 2012). Increasing student active engagement influences student motivation to participate in class and, therefore, increase retention of the concepts taught.

Transfer

For students to gain proficiency in math, they must be able to transfer knowledge to a variety of applications. Jones, Jones, and Vermette (2009) asserted that in order for transfer to occur students need multiple opportunities to practice. Drill and kill are not a recommended practice, as it does not lead to strong foundational understanding for applicable transfer. Connections to real-life applications and problem-based learning are top tiered transfer formats. Additional research by Iseman and Naglieri (2011) advised teaching students planning strategies through group discussion that build cognitive strength, so students are able to transfer math knowledge.

Teacher Influences

Teachers can influence student understanding of math concepts as derived from Tyminski's (2010) discussion of Boole's (1931) teacher lust concept, in which teachers force their math understandings onto their students and attempt to control student

learning to mirror their own. When this happens, according to Tyminski, teachers damage the students' ability to learn. One reason that students may struggle with math is the teacher's lust prevents them from having a deeper understanding to the math concepts taught. However, there are times when teacher lust is effective, such as when a teacher stops students from fully sharing solutions that could cause other students to become confused, or to save instructional time. Tyminski (2010) suggested teachers reflect on their own teacher lust and balance when it comes into play in their classroom. Allowing teachers to self-reflect on when their own experiences affect student learning might push them to continually refine and improve their instruction.

Using professional learning communities (PLCs) provide a safe environment for teachers to collectively address issues around classroom instruction. Holmstrom (2010) discussed one districts response to fix the problem with low achievement especially with their low-income students. The process began with building professional learning communities facilitated by teacher leaders. The PLCs analyzed data, created formative assessments, and collaborated on action plans for struggling students. In relation to instruction, only the math models and manipulatives that provided the highest-yield for increases in student achievement. Teachers were regularly challenged to share the rationale or why behind math procedures rather than just the algorithm (Holmstrom, 2010). Encompassing the collective support of math PLCs might support teacher commitment and participation in improving student math achievement.

Implications

This study sought to promote social change in the way teachers and schools approach teaching math. Teachers have shared anxiety about teaching math that is based on constructivist approaches (Yazıcı, Peker, Ertekin, & Dilmaç, 2011) because they tend to teach math in more direct instruction ways similar to how they were taught (Harbin & Newton, 2013). The NCTM standards called for a paradigm shift in approaches to teaching math with a focus on constructivism and student-centered learning (Clements & Battista, 2009). In addition, teachers are expected to use representations to support student contextualization of math concepts rather than algorithms alone (Timmerman, 2014). Again the goal of these changes is to move away from the "drill and kill" of isolated facts through direct instruction is necessary for success on common core state standards and new rigorous assessments.

Teaching students how to solve problems and approach math from a fixed mindset focused on algorithms follows the assumption that teachers rely on teaching methods they were exposed to when they were in school. Current research and practices support conceptual teaching of math, while focusing on understanding and pushing students to express their thinking in multiple ways. Therefore, the gap in practice lies within the tension between procedural and conceptual teaching of math. My study resulted in a project that will help address this problem by providing teachers a professional development series and toolkit of research-based best practices for ensuring students from low SES are more successfully served.

Summary

As the research stated, struggling math students need to build not only procedural knowledge, but also conceptual knowledge to build connections and foster transfer. Students most often get confused when they are taught math rules without understanding the relationships among concepts. Students from low SES have additional math struggles due to their lack of skills beginning in the primary grades. While many studies share potential cause of low math achievement there is not enough information about causes within the subgroup of low SES youth.

Teachers play a vital role in understanding how their math experiences influence students learning. In addition, teachers must provide students meaningful practice and use real life applications whenever possible particularly to overcome limited experiences for low SES youth. Because students have a varying degree of schema, teachers have to find ways to motivate disengaged students and provide alternative ways for students to show what they know including project based activities. Providing support to low-SES students to overcome the achievement gap is an obstacle many math teachers face when helping those students conquer math content. This study used a qualitative research design to explore teacher perceptions on what is causing low math achievement for struggling and low-SES students, and what strategies teachers are using to support them. In addition, understanding how teachers modify instruction and their perceptions on the quality of the professional development they received to teach the new CCSS for math.

Section 2 provides a description of the methodology for the qualitative case study and rationale for the study design. Section 3 describes the project and implications.

Lastly, Section 4 shares alternative reflections on the project, recommendations, and investment as a scholarly practitioner.

Section 2: Methodology

Introduction

The qualitative research design selected for this study was a case study. The case study included interviews to gather teacher perceptions on how to support struggling math students in their classrooms, reviews of lesson plans, and archival math student data. Creswell (2012) substantiated the use of case studies as a research design to support an extensive examination of an activity, occurrence, practice, or person.

Research Design and Approach

Investigating teachers' perceptions on how to support struggling math students aligns with the main elements of a qualitative case study design approach. Lodico, Spaulding, and Voegtle (2010) stated that case studies are valuable because they are a form of qualitative research that "endeavors to discover meaning, to investigate processes, and to gain insight and in-depth understanding of an individual, group, or situation" (2010, p. 269). I decided to use a case study approach to gain a deeper understanding of the situation related to math achievement, and the practice I examined was how teachers approached supporting struggling students. The research was based on identifying what strategies elementary teachers use to teach mathematics and how they modify instructional practices to support low-SES students. In addition, I asked teachers to share their perceptions of the training they received to teach the new Common Core State Standards.

The specific type of case study used was an instrumental case study. Instrumental case studies focus on providing insight to one particular issue (Creswell, 2012). In this

case study, I examined how teachers support struggling math students by understanding what supports are being used in their classrooms. A case study approach allowed me to use interviews asking how and why questions in order to understand the phenomenon, as suggested by Merriam (2009). During the interview process, the researcher often asks open-ended questions and responds to the participant's answers with probing questions (Hatch, 2002). In this study, I collected interview data from lower elementary teachers in grades two through five who taught math to low socioeconomic students. The group of teachers selected created a bounded system because they were bound by a geographic location and school site. The bounded system aspect of case studies differentiates from other types of qualitative research designs (Creswell, 2012; Hatch, 2002; Merriam 2009).

Other qualitative research designs that were considered and rejected included grounded theory and phenomenology. Typically, the grounded theory approach focuses on collecting enough data about an experience, event, process, or situation to generate a good theory as the final outcome (Creswell, 2012; Merriam, 2009). Grounded theory was not an appropriate choice because the goal of this particular study was not to develop a new theory. In addition, a phenomenology study was not useful because the focus of the study was on what instructional practices teachers were using to support low-SES students, not what it is like to be a struggling math student or what it is like to be labeled a low SES youth. A phenomenological approach could have been useful to explore what it is like to be an elementary teacher working with low-SES students; however, the results would not have correlated directly to understanding the issues low SES face in math.

Participants

The study took place at XYZ Elementary School (pseudonym) in the northern California. At the time of this study, the school body was comprised of 640 elementary students and 40 staff members. I selected the participants for this study based on their having roles in teaching math to second through fifth grade students and had worked at XYZ Elementary. Seventeen teaching staff met the criteria using purposeful sampling. Purposeful sampling allows researchers to "intentionally select individuals and sites to learn or understand the central phenomenon" (Creswell, 2012, p. 206). Purposeful sampling was required in this study to choose participants who could not only share their views on supporting struggling math students, particularly those from low-SES backgrounds, but also had at least two years of teaching experience.

Creswell (2012) emphasized that a sample size of only a few individuals is needed in a single case to provide a thorough picture of the phenomenon. Creswell also stated that the objective of selecting qualitative research design is to "present the complexity of a site or of the information presented by the individuals" (p. 209). Having a large number of participants reduces the researcher's ability to meet that objective. In addition, Hatch (2002) stated that the sample size is determined by the purpose of the study through the types of questions the researcher seeks to answer. The fewer the number of participants selected for this study provided a richer study because of the level of depth within the questioning and input from each participant. I interviewed 10 participants for this instrumental case study who met the criteria.

Procedures Used to Gain Access to Participants

I have a professional relationship with the district administration and teachers at the school because I was previously an employee there. I communicated with the district administration executive office through email for cooperation in this research study (Appendix B). The request included information about the purpose, significance, and expectations of my study. I also submitted my research questions and interview guide. Once I obtained the letter of cooperation, I invited teachers who met the criteria to participate in the study via email. All participants were informed of the expectations for participating in the study and that participation was voluntary. Efforts were made to establish a research-participant relationship by responding to all email questions and concerns as well as conducting follow-up phone calls.

Ethical Considerations

Conducting qualitative research requires ethical treatment of the participants. The Walden University Institutional Review Board reviewed and approved the qualitative research study (approval number 10-06-15-0279545, 2016) before I made any contact with the participants. Ethical considerations incorporated into this study included gaining informed consent, ensuring confidentiality, and protection against harm by providing full disclosure to all participants. During the interview process, I reminded participants of the purpose of the study and that participation was entirely voluntary (Hatch, 2002). I ensured they understood that they could withdraw from the study at any time and any information collected would not be reported to their administrators.

All teachers who agreed to participate in the study were asked to fill out an informed consent form that outlined all the information pertaining to the study and participants returned them with electronic signatures or scanned signatures via email. The consent forms were saved in a password protected file to document completion of this step. Numerical pseudonyms were randomly assigned to protect the confidentiality of the participants. Protecting their anonymity allowed the participants to trust me as the researcher and to speak freely in answering the interview questions. Additionally, the transcribed data will be destroyed after 5 years, so the participants' privacy is maintained.

Data Collection

Within this case study design, I carefully considered what might be the best data collection methods. The purpose of this qualitative case study was to explore elementary teachers' perceptions of staff development, strategies, and modifications that support low-SES students' math instruction. Understanding teachers' perceptions was central in building meaning for this project because teachers' perceptions help shape the quality of the math instruction that low-SES students receive. This study incorporated 10 interviews of elementary teachers, math lesson plans, and archival student achievement data.

Interviews. According to Creswell (2012), interviews allow the researcher to collect narrative data in the participants' own words in order to develop a clear understanding on how participants perceive a piece of the world. Math teachers in grades 2-5 were invited to participate in the study. After receiving consent from the participants, I scheduled a time for the interview that was convenient for each participant. A total of 10 interviews were conducted during noninstructional time. The interviews began with

establishing a rapport with the participants by checking in with participants and engaging in small talk about their day. Next, I provided the participants with a general overview of the purpose of the study, assurances of confidentiality, and procedures moving forward including a reminder that participation was voluntary and they were allowed to withdraw at any time.

A semistructured interviewing technique was used for the interview portion of the research study. This method was appropriate because it allowed me to combine predetermined research questions with additional follow-up questions called probes. Probing questions enable the researcher to gain clarification and dig deeper into the participant's perspective of the phenomenon (Bogdan & Biklen, 2007). I included open-ended questions to give the participants the opportunity to share his or her thoughts freely on working with struggling math students. This type of interview data collection process is appropriate to gather rich description of the participants' thoughts, views, and beliefs about their experiences working with struggling math students.

Consent to allow audiotaping during the interview process was obtained prior to the interviews. Interviews were planned for 30-45 minute segments per interviewee after school through phone interviews so that instruction was not disrupted. Each interview was recorded and transcribed for future analysis and theme coding. I kept a reflective journal during the interviews to capture my thoughts, and compared them with the final transcribed interviews. A copy of the interview was sent to participants to ensure quality and accuracy.

Documents. I also requested that participating teachers provide me with math lesson plans to provide another data source. Teachers sent me a copy of the lesson plans that were used during the months of December and January. The purpose of using the lesson plan documents was to support the research question related to strategies used to support struggling math students from low-SES backgrounds. These lesson plans gave me insight into the activities and tools teachers planned and put into practice to assist their low-SES students. The secondary purpose of the lesson plan collection was to validate the interview data to check for alignment between classroom practices and teachers' interview statements.

Archival data were the third source of data collected for this study. The archival data used were CST scores from the 2011–2012, 2012–2013, 2013–2014 school years for second through fifth grade. The scores represent the students' achievement levels in math for the three years. The data helped quantify the effectiveness of the strategies teachers used to support struggling students as well as substantiate information gained in the interviews.

The archival data and lesson plan documents were checked for accuracy and fit within the study. Participants' names and school identifying information was removed from the documents to respect confidentiality. After reviewing the documents, they were triangulated with the interview data to assess the strategies and modifications put in place to support low-SES students. Teachers' perceptions of the effectiveness of the strategies and modifications were noted and coded.

Role of the researcher. I was previously affiliated with XYZ Elementary School for three years when I was employed as a kindergarten teacher of literacy and moved into the role of assistant principal. As the assistant principal, I coached and observed teachers who taught math and literacy. There were two participants that I had a supervisory role and directly coached in the past. However, I was no longer employed by the school during the time of the interviews and had moved out of state prior to this study. Prior to working at this school, I had 7 years' experience working in elementary grades teaching all subject areas and working with low-SES students. Due to my previous experiences with teaching math and working with low-SES students, there were some biases I brought to the study. I used a reflection journal to recognize those biases and documented them. Merriam (2009) shared that acknowledging biases and assumptions allows the researcher to understand how interpretations of the data can be influenced by the thoughts and feelings of the researcher. After each interview, I reflected on what was collected and recorded my initial thoughts and potential biases.

Data Analysis

All the interviews were recorded via audiotape and transcribed into a Microsoft Word document by me. I determined themes were determined from analyzing the data and coding words and phrases related to the research questions. Glesne (2011) described this process of finding themes and patterns in the data as the analytical technique. The analytical method utilized was a typological analysis technique, which involves finding themes that emerge from the data that is placed into tables and labeled into categories (Hatch, 2002). I began by thoroughly reading the transcribed interviews and began the

iterative process of labeling events, concepts, and patterns looking for similarities and differences. Then I color-coded the data based on identifying similarities in participants' statements and referencing my reflection journal. I arrived at nineteen larger codes, which I began to condense as I continued to analyze the data. The research questions guided the typologies used in this study and the coded interview excerpts supported any generalizations (Merriam, 2009). I did not force concepts together but instead used my research questions as a guide, this began the process of grouping similar codes together into domains that uncovered the major themes based on the participants' comments. I used repeated readings of the transcripts to discover if any new questions or perceptions emerged until saturation of the final categorized themes was achieved. The identified themes were strategies teachers used to support low-SES students, instructional resources, effectiveness of professional development, and additional factors affecting low-SES students.

Interview data were not the only data collected, so following the typological analysis an inductive analysis was conducted on the lesson plans obtained. The lesson plans offered insights into how math instruction was planned and delivered. Document analysis included reading the lesson objectives, reviewing the format, and identifying activities to search for alignment between participant statements of effective learning practices for low-SES students. I reviewed the data to identify additional themes that may not have been included in the first analysis session. The same color-coding system was used to identify instructional strategies and supports provided. I kept a research journal to

document my reactions to the data and ongoing thoughts for each analysis phase. Table 3 summarizes document analysis of lesson plan activities.

Table 3

Analysis of Lesson Plan Activities

Lesson Plan Activity	Frequency (%)
Manipulatives	100
Sequential steps	70
Review of previous concepts taught	90
Real-life connections	100
Story problems	60
Teacher modeling	100
Questioning techniques	90
Visual representations	80
Assessment/Exit ticket	70

Quality and credibility. Efforts were put in place for this research study to be deemed credible so that the final results can be used to support any math teacher who works with struggling students. One way I reached this goal was by using member checks to ensure reliability of the study. Member checks involve taking the "data, analysis, interpretations, and conclusions back to the participants so they can judge the accuracy and credibility of the account" (Creswell, 2007, p. 208). Furthermore, Lodico et al.

(2010) stated that member checks help safeguard the study from including any biases from the researcher that may influence the study.

Credibility was also achieved through triangulating the data from the three data sources used: archival student achievement data, interviews, and lesson plans. These sources were analyzed and used to balance the construction of this study. Dependability of this study was addressed by ensuring all procedures and processes used to collect and analyze the data were captured with detailed explanations (Lodico et al., 2010). I kept a research log, and all data collected were put into a locked file cabinet as well as some files on my personal laptop that were password protected. My research log served as my internal audit to keep me accountable and decrease researcher bias.

Discrepant Cases

One participant stated that all math professional development that had been provided was helpful in preparing them to teach common core related math whereas the rest of the participants felt they were not adequately prepared to teach the rigor of the common core. This particular participant was asked questions to clarify the view. I continued to ask questions until the position was clearly understood. Their responses are reported within the findings.

Data Analysis Results

The purpose of this qualitative case study was to explore elementary teachers' perceptions of math teaching strategies, modifications, and staff development that support low-SES students' math instruction. I interviewed all the participants that provided consent to take part in the study. Ten of the 12 participants contacted agreed to participate

in the study. I informed the participants that I would tape record, transcribe, and give them an opportunity to review the transcript to check for accuracy. During the interview I used the interview guide (Appendix C) and gave each participant time to respond to each question. At the end of each interview I immediately transcribed recorded information verbatim.

A typological analysis was used where color-coded interview excerpts were placed into prearranged categories (Hatch, 2002). The analysis process included a reading of the transcriptions, next I captured emerging themes and color-coded the themes into categories, and then I carefully matched to the corresponding research question. The typologies teachers discussed in the interviews were strategies teachers used to support low-SES students, instructional resources, effectiveness of professional development, and additional factors affecting low-SES students. The findings were organized by research question with the use of rich descriptions from participants' direct quotes highlighting their experiences working with students from low-SES students as well as descriptions of the math professional development they received. The typologies will be addressed in more detail below including any sub-themes that were identified during the analysis phase.

Findings

The findings from the data analysis phase are linked to each research question, which guided the case study. The interview questions that were constructed to obtain responses asked for approaches teachers use to teach mathematics, what are perceived instructional strategies that work best to support low SES as well as strategies that are not

successful, what factors lead to underachievement of low-SES students, and perceptions of the professional development they received to prepare them to teach math and the CCSS. Based on the analyzed data, there were four major themes identified and eight subthemes. This section is organized by research question linked to the connecting theme. Research Questions 1, 2, and 4 are linked to Themes 1 and 2. Research Question 3 is linked to Theme 3 and Research Question 5 is linked to Theme 4.

Research Question 1

The findings for Research Question 1 ("What strategies do elementary teachers use to teach mathematics?") highlighted a variety of strategies teachers used but the most consistent strategy was the use of manipulatives. Math manipulatives allowed students to use math objects to represent math concepts and allowed them to physically manipulate them with their hands. Students were more capable in making connections as they use their hands to understand the configuration of math concepts, thus promoting higher levels of student learning. Other recommended strategies included visual representations or math drawings on anchor charts, and kinesthetic movement such as acting out story problems with real life examples. The success teachers reported came from finding ways to make the information accessible for students.

Research Question 2

The findings from Research Question 2 ("How do teachers modify instructional practices to support struggling math students?") identified that teachers used data to support modifications in instructional practices, which included the use of math intervention. Teachers reported using small group instruction or intervention blocks to

provide additional support for students. Plans for small group instruction or intervention groups were provided in the document data. Research question two accentuated that when providing intervention, it is important to reteach the concept in a different way than was initially presented and using the data to drill down to the specific skills the students need addressed. Progress monitoring is vital to ensure the intervention supports are truly affective.

Research Question 4

The findings from Research Question 4 ("What are instructional strategies teachers perceive that lead to underachievement of low-SES students?") focused on what teachers perceived were instructional strategies that did not support low-SES students. Teachers named drill and kill of algorithm memorization practice as the most detrimental to low-SES students because they are not developing skills but rather memorizing discrete facts. Other failed practices included providing additional independent practices problems, which is ineffective if students are already struggling and jumping into grade level content without assessing their preparation to do so. Knowing your students and avoiding a fixed-mindset helps your low-SES students feel success. If you don't believe they can do it and they also don't believe they can achieve, then they will not make the necessary gains. Everyone should be on the same page and encouraging all teachers to use effective versus ineffective instructional strategies when working with low-SES students is the foundation to their success.

Theme 1: Strategies to Support Low SES

Teachers in this study believed that struggling students especially those from low SES background need supports when grappling with math concepts. A variety of supports teachers identified were manipulatives, which are objects students can manipulate with their hands to understand a math concept, physical models such as base 10 blocks or digi blocks, visual representations or drawing out math concepts usually on anchor charts or a board, and kinesthetic movement in the form of using student bodies to show a math concept. Acting out math story problems and using real life examples were additional tools teachers used during their math lessons. Teachers stressed that students needed to physically manipulate objects to practice and relate to the concepts taught in the lesson with remarks such as "They need something tactile to help them visually see the representation" and "I would always use manipulatives whenever I could because I think it's good conceptually for young kids." Teachers who taught upper elementary also believed in manipulatives and visual representations, "I used a lot of hands on conceptual approaches allowing students when possible to use manipulatives." Making the information accessible for the students was the main priority for the teachers especially when working with those from low-SES backgrounds.

More practice through intervention. An additional focus of the teachers included being responsive to data whether formally or informally as it related to the success of their low-SES students. All of the teachers spoke of some sort of math intervention to provide additional support with math deficit areas identified in their students. The teachers shared they used small group time, intervention blocks, or one on

one tutoring. Teachers shared why intervention was so important, “If those holes aren’t filled you’re shooting in the dark,” and another participant shared “Going slower with kids who need more processing time and giving them a chance to grapple with it longer is important to build confidence.”

They also advised that when pulling intervention groups, it is vital to reteach the concept in a different way, “If they didn’t get it in the main lesson usually it’s not always like they can just see it more times then finally get it,” which takes careful planning and time to build in this differentiation piece. Many of the participants suggested breaking down the math into steps to scaffold the learning, asking questions to allow discourse in the classroom, modeling for the students, and getting them to physically move or manipulate objects to make it concrete.

Participant 5 stated:

> Once I have identified those kind of smaller gaps, and I’m able to either find resources or compile resources or create my own lessons that would be able to address those certain gaps for the students, and they could patch those up and sort of work their way back up to the grade level standard.

Another essential practice used by the teachers included a review of previous information taught through repetition to set up students for success and was a regular occurrence in many of the classrooms. In upper elementary teachers discussed preteaching skills as a way to introduce concepts before students learned them in an upcoming lesson, which helped build math confidence and retention of information.

Ineffective strategies. Many teachers could name strategies they have used that were not successful or practices they have observed peers use. For example, there was overwhelming dissatisfaction with the practice of "drill and kill" techniques and memorization of algorithms. Comments shared included, "Schools working with low SES…they focus just on drilling kids and unfortunately we're really great at testing those skills but not at testing the more complex learning." Another stated, "If you can hit and drill easily tested skills it looks like you're serving your kids pretty well but when they hit algebra and precalculus they will struggle because they don't have the deep knowledge to do abstract mathematical thinking."

When asked what should teachers avoid doing, one teacher stated, "Just giving the students extra practice problems but without first making sure they knew how to solve them is ineffective." Another teacher added that knowing that students from low-SES backgrounds might lack prerequisite skills teachers should understand, "Anything where independent practice work starts before students are ready to work independently was not effective. Jumping into a problem at grade level without assessing student needs first especially if it's a more abstract problem is pretty ineffective."

A teacher's fixed-mindset towards students was also acknowledged as an issue as stated by Participant 6:

> Sometime teachers try to dumb it down. I'm like nope that's not necessary or they try to not make it as rigorous and that's not it. It just has to be relevant I feel like once it's relevant then you can incorporate it and make the connect to whatever strategy it is. Any strategy will work as long as kids are motivated to do it.

Participant 7 shared:

> Reliance on rote memorization and drilling that's difficult to get passed, and there is so much more than algorithms. They need to know how to build the algorithm, how to prove them, and where they come from, and what they mean. It's pretty easy to teach the algorithm to teach the surface knowledge to a level of fluency like memorizing addition and subtraction facts it's much harder for children to be able to discuss number sense and how quantities are derived and manipulated. While sometimes we use drills to build fluency, it is a disservice to our low-SES students if we do not challenge them beyond this low level of practice and set them up for success by building foundational skills they can build upon later.

Theme 2: Other Factors Affecting Achievement of Low-SES Students

There are contributing factors that can have an impact on the success of students from low-SES backgrounds. The participants shared their perceptions of challenges that low-SES students face that might contribute to their lack of success in math. The vast opinion held by majority of the participants included matters dealing with home life that had a significant impact on the success of their low-SES students. These included concerns ranging from parental support to access to early educational tools. Teachers felt that parents' ability to provide support with homework was important. Sample comments from participants on this theme included "I would say support at home with homework not just completing it but when you notice you are trying to help with the problem and you see they don't get it" and "One of the largest factors would be the support they are receiving at home. If they had parent help on class work or parent help with homework

and the involvement of parents into what their students are doing to keep them accountability [accountable].” However, other participants also recognized challenges parents face that might hinder them from being able to support their child consistently at home.

> One participant shared the changes in common math versus traditional methods,
>
> With CCSS there’s a whole new terminology and if students and parents don’t have access to the internet and books and things like that to learn about the new standards and what they mean; then they are going to be teaching their students the old way which is going to confuse them.

Access in terms of early educational resources such as Headstart or Pre-K programs was another factor teachers named that affected low-SES students. “The biggest impact is just access to preschool and programs like high quality Headstart that have a huge impact on the exposure to language and vocabulary development and beginning conceptual development laying the groundwork for things they are going to be learning at school.” one participant stressed.

Another participant identified, “Exposure to vocabulary, parent education, and resources available to families.”

> Participant 7 shared:
>
> Developmental delays and they have less time one on one because parents are working 2-4 jobs to provide for their family and they were with 1 adult with up to 10 kids in the family that was watching them. They didn’t have the opportunity to go to preschool and daycare…was literally we’ll watch your child.

Teachers shared having compassion for families and trying to work through a partnership between home and school was beneficial in supporting their low-SES students in math.

Participant 8 shared ways to help parent apply what students were learning in school:

> When you're driving count things, when you're out running errands, when you're cooking or setting the table, or when you're getting dressed or when you're folding clothes build in counting build in sorting talk about shapes and colors when doing laundry. Thinking of practical small ways to add everyday activities was more than what I could do in the classroom. It was all concrete based real objects and real quantities by manipulating them.

Participant 10 shared:

> I tell parents they are important…the learning and instruction that we've been teaching your kids doesn't stop at school it continues at home. I think it's important…I only have 90 minutes with them but they still have to exercise what I've been teaching them. It wouldn't be effective if they don't exercise or practice the material that has been taught to them at school.

Student based factors. There was also agreement among the participants about internal factors that affect students, which could affect their learning as well. "I would say number sense, confidence, and retention of information because many people struggle to recall information." Unrealistic expectations students put on themselves was another factor, "Sometimes the kids aren't clear that math takes practice. Some instruction is set up to make them think they should get it the first time." Creating an

environment where students feel comfortable taking risks and preserving over challenges the teachers suggested was key.

Teachers felt that students also experience stress from their home environment causing issues with safety and belonging. Reports about environment were: “Stress is a huge factor such as police officers across the street at the houses and it’s hard to feel comfortable and safe when you know there are unsafe things happening close by.” Another teacher claimed that “Some students, not all from low-SES backgrounds would come in with trauma they are dealing with or sometimes with less consistency at home which is out of parents control so it means that when they’re coming into class they are already emotionally struggling for the day.” Another participant discussed student motivation, “I typically find students from low SES and ELL tend to do better at math rather than literacy in the beginning because it’s visual. The difficulty is when it’s abstract and you actually have to apply comprehension, they usually struggle.”
By being aware of, these student-centered factors, teachers can support creating an environment where students feel safe and can overcome additional challenges stemming from factors outside the classroom but still affect achievement.

School-based factors. Participants also recognized factors that occur within the school environment that could potentially affect students including the quality of instruction. An example of this view is, “I think that the idea of high quality instruction is essential especially for kids in low SES because a lot of the schools don’t have the high quality instruction that’s necessary for them to be on par with their higher income peers,” explained one participant. “Teacher quality, instruction, and curriculum quality and

consistency…consistency in their academic experience so having the high quality teachers throughout their entire elementary experience and a high quality instructional program that consistency that it's not changing all the time so that they can actually see the benefit of the progression," remarked another participant.

The teacher's mindset was presented as well, "If the teachers don't have high expectations of them it's going to cause a barrier as well. If they're not looking at them and having the aspect of a growth mindset so that they can learn…to me that is going to be the biggest barrier." While another participant expressed the affect new teachers might pose on quality of instruction and student internalization of math failure.

Participant 4 said:

> A teacher coming in not being familiar enough with the content not being familiar enough with the subject such pedagogy to introduce the material in a way students are ready for it. Students can early on get this impression that they are not good at math when really it's not being presented in a really clear way the first time. I've seen some really confusing math lessons given by teachers that are 1st and 2nd year that are really coming from a place of teachers that have never thought through how to teach that particular lesson before and how to break down the skill in a way that's going to make sense to someone else. And the kids don't understand or know why it doesn't make sense, and they think it's their fault [that] it's not making sense. They feel they're just not good at math and I've seen some students have this idea they don't know how to do math because he instruction wasn't clear and they internalize it's something going on with them.

Research Question 3

The findings from Research Question 3 ("What are instructional strategies teachers perceive best support achievement of low SES identified students?") focused on what teachers perceived were good instructional strategies that supported low-SES students. Along with the use of manipulatives, visual representations, real life examples, and intervention, teachers also suggested preteaching skills before a new unit as a way they supported low-SES students build exposure. Another instructional tool added from the curriculum used was focused math teaching using the CPA (concrete-pictorial-abstract) strategy. This method combined the best practices for teaching math into one strategy. Concrete included the use of manipulatives or math tools, pictorial included the visual representations, and then abstract was where the actual math algorithm was introduced. This supported low-SES students because they algorithm was not forced upon them at the very beginning of the learning cycle which can be very confusing without any background knowledge, instead students had time to grapple with the concept with two other representations that supported them building a deeper understanding.

Theme 3: Instructional Resources

The teachers recalled both instructional tools that were used prior to the implementation of Singapore Math and tools used when the curriculum was implemented. Many teachers enjoyed using Singapore Math because of the focus on teaching math using the CPA strategy, which moved from concrete to pictorial to abstract representations. "I would make sure that I'm making it concrete and giving them pictorial representation or manipulatives to show them the concept. Usually that's why they're

struggling because the concept is too abstract for them to understand" was a quote from one participant.

Another participant summed up their feelings about Singapore Math by affirming "We're switching to the goal of today's lesson is to really see the various ways we can approach the same problem and then having the students actually analyze which is better." Singapore Math focuses on students building conceptual knowledge by discussing solutions where the target is on mastery not memorization. Another teacher shared "I think it works best when you start in kinder and then keep going because there was a lot of spiraling and a lot of repeated practice" which support the ideas of Singapore Math building towards mastery.

Previous approaches to teaching math. Prior to Singapore Math teachers were writing their own curriculum based on standards as one participant shared "The planning was the greatest resource, using the common core standards to backwards plan what I would be teaching."

Other teachers shared the piecemealed items from previous curriculums used. Combinations of the following resources were utilized: Math Lands, Investigations, Envisions, Everyday Math, Marilyn Burns instructional book, and online resources such as Zeal, KHAN Academy, TFANet, Brainpop, and SG Math. There was no set curriculum because the focus was on memorization of math facts to build fluency and rote drill and kill of concepts which teachers felt were not effective strategies for reaching low-SES students. The goal was for students to master deficit areas on the math benchmark assessment, which included attempting to master discrete skills. A participant

stated the resources from the piecemealed curriculum was not effective, “All the small group everything and 2nd grade it was the same lesson I taught whole group just in smaller format. So I tried it and it was not getting students what they need at all.” Teachers relied on deconstructing assessments and trying to align a variety of resources to help their students succeed but with teachers having autonomy to use whatever they wanted it was hard to build consistency across classrooms.

Attitudes about upper elementary use of Singapore Math. Teachers felt that some aspects of the Singapore Math were very helpful such as the bar modeling and CPA (concrete-pictorial-abstract) framework. A 4th grade teacher remarked, “I love to use bar models so modeling the how to of the mathematical approaches for all the algorithmic type problems I thought were very useful with images and models.” However, other upper grade teachers collectively found the lack of success in upper grades disheartening.

Participant 4 stated:

> It wasn’t very successful particularly because we started in 3rd, 4th, and 5th grade and there was a lot of background skills that our students didn’t have yet. So we switched out of using Singapore math and then started just going back to using some of the worksheets using some of the problem sets but focusing on one way to solve a problem each day.

Participant 9 reflected:

> Trying to plan it out so that it was a lesson that built from the concrete to the abstract, which was something Singapore Math targeted, but didn’t include as much of in upper grades and again that might be because it did early on when the

> concepts were introduced the first time but picking it up in higher grades when it's intended to be started in kindergarten…it didn't really become very successful.

When adopting a curriculum school-wide, it is important to create a plan to ensure any gaps through the adoption phase are addressed across the grade levels so all students can effectively access and engage with the new curriculum.

Additional support structures. Teachers acknowledged other needs that must be addressed when supporting low-SES students and shared experiences when they have gone above and beyond to meet needs that were outside of their direct math instruction in class. For example, one teacher stated, "I would then incorporate extra speech or manipulation with additional small or large items for issues with fine motor skills into my math lesson or small group." Another stated, "I sent home learning activity kits so families could play games at home to support struggling students at home as well." Other teachers reported conducting home visits to teach parents new math concepts or just to provide support to both the child and parent with homework completion.

Research Question 5

The findings from Research Question 5 ("How do teachers perceive the district and campus professional development has prepared them for teaching the math Common Core State Standards?") focused on teachers' perceptions on the effectiveness of the professional development they received for teaching math. Teachers expressed dissatisfaction in the professional development they received targeting delivering effective instructional practices and strategies. Teachers felt they receive adequate

training for the Singapore Math curriculum the school adopted in the form of implementation and a curriculum introduction. Teachers felt the missing piece was how to modify the curriculum beyond the scripted lessons. In terms of CCSS, teachers received a broad introduction of the standards but teachers wanted to delve deeper into how to break down the standards and how to translate skills so that students understood them as well. Teachers also wanted more connections between how to teach common core and best practices for teaching math to struggling students. Teachers collaborated and discussed strategies that aligned to common core but expressed a need to have professional guidance with this and not just during casual meeting during summer professional development or optional meetings after work when they are exhausted from teaching.

Theme 4: Professional Development

All teachers in this study had participated in math-related professional development. The participants felt the professional development provided on Singapore Math helped acquaint them to the curriculum but did little to prepare them to actually teach in this new method. Teachers felt during summer math professional development, "We had training over Singapore Math curriculum where we were taught different strategies and how to implement it in the classroom." Another teacher shared, "We reviewed the curriculum and how it works and the type of components the curriculum comes with but they don't really think about how it applies to the ways you can modify it or suggestions and resources beyond what's written on the page."

When probed, two teachers recalled the district's response to the need to have more support, "We had a math expert or math professional who worked on Singapore and she ran outside PD and we met once a month from 5-7 pm. It was hard, at first people were excited but it was hard [to] ask for teachers to do that from 5-7 after teaching all day, it wasn't effective." Another teacher shared, "We also had training on how to facilitate strong small group intervention with our students and how to decide on which students to place into which groups." Teachers felt they needed more support with the implementation of the new curriculum beyond the summer sessions meaning [that] this left teachers and their coaches to struggle with what they perceived was best resulting in some grade levels deciding on scrapping parts of Singapore Math to piecemeal their math lessons while others completed a full implementation.

Attitudes about preparedness for common core math. Teachers believed that aspects of the school-based training they received were helpful in terms of giving a broad overview of the common core math standards but district training was mostly focused on introducing the Singapore Math curriculum components then creating a scope and sequence for the year. One teacher suggested a better use of the time would include teacher practice and feedback around the standards, "We are going to actually practice it as teachers to find misunderstandings before we teach if effectively to students. This doesn't happen in PD; this has been research tested, etc." Another teacher shared that it was not the professional development that effectively prepared him for the common state standards but learning from other teachers. They stated, "I found that very beneficial

because I could collaborate with other math teachers and we could talk about strategies and how to execute common core aligned math techniques."

The overall reaction to the training was that while some of it was useful, collectively teachers wanted more guidance in breaking down the common core state standards. A teachers shared, "We needed more support on when I look at a standard; what does it actually mean and breaking down what a standard means and what are all the little skills that a student needs to already understand that you have to make sure they understand so that they can understand the standards," emphasized a participant.

Conclusion

Section 2 of this study presented an account of the methodology, research design, participant selection, quality measures, data collection process, and data analysis procedures. Findings from the data analyses in relation to the guiding questions illustrated strategies teachers perceive are effective in supporting low-SES students in math instruction as well as those deemed ineffective. Teachers at the site embraced the tenets of the common core state standards and the higher level of conceptual thinking required to master the standards but did not feel supported in the quality of the professional development they were given. Furthermore, teachers recognized there were additional external factors that affected the achievement of their low-SES students and their ability to successfully master math. Based on the themes identified, Section 3 includes a project and implementation plan for a professional development series designed to address how teachers can effectively support low-SES students.

Section 3: The Project

Introduction

The purpose of this qualitative case study was to explore elementary teachers' perceptions of staff development, strategies, and modifications that support low-SES students' math instruction. Findings from the data analysis showed teachers reported a lack of confidence in the professional development they received to teach math effectively as well as deficits in skills necessary to address external factors that affect their low-SES students. Based on ideas expressed from participants, a 3-day professional development series was designed to address strategies that can be utilized to effectively teach math to raise achievement of low-SES students as well as training on how to better prepare teachers to address outside factors contributing to their lack of success.

Description and Goals

The project created from this study is called *Guiding Struggling Math Students Toward Success* and is a professional development series on best practices to support struggling math students from low-SES backgrounds. The research findings presented in Section 2 indicated that teachers wanted support on how to teach math to this population of students because currently the math professional development provided was lacking. Specifically, teachers wanted professional development that delves deeper into how to break down the standards and how to translate skills so that struggling students could find success as well as time to plan effective math lessons. According to Avalos (2011), the core of professional development is centered on teachers developing as learners and transforming instructional practices to support student academic growth. However, the

teachers in this study also wanted to become equipped with strategies to address additional outside factors that could impact their achievement. Providing teachers support with increasing their awareness of outside factors affecting low-SES students helps close the achievement gap (Lacour & Tissington, 2011).

This project was designed to address those factors reported by teachers during the data collection phase. Another function of this professional development is to provide supplementary information on potential external factors teachers should be aware of when working with this population of students and ways to support them. The three-day training includes multiple activities aimed at building strong alliances and efficacy in moving the math achievement of low-SES students.

The project is designed to provide teachers with explicit classroom strategies and instructional tools targeted toward increasing achievement of low-SES students. This includes providing an array of teaching strategies teachers can choose from to motivate students to master skills and increase self-confidence. The professional development is also designed to bring awareness to factors that affect students outside of the classroom, which could inadvertently impact learning. The professional development was planned for face-to-face meetings to capitalize on professional discourse among participants and allowing for collaboration of best practices. The three main goals of the professional development are:

1. Teachers will demonstrate knowledge of strategies for implementing differentiation, explicit instruction, and student motivation.

2. Teachers will incorporate differentiation, explicit instruction, and student motivation into their lesson planning.
3. Teachers will collaborate on ideas on how to increase parent involvement and address student lack of access to educational resources.

Rationale

This project was selected and designed as a result of the study findings showing that elementary educators want to have access to quality professional development that helps prepare them to effectively teach math to struggling students while also addressing external factors that can inhibit the growth of students, particularly those from low-SES backgrounds. Previous practices included trying to piecemeal curriculum or use teacher created resources that may or may not have been based on research. Teachers felt they needed to rely on their own teaching designs because either the curriculum was lacking or the students just were not responding as demonstrated by limited achievement. The literature review also substantiates that professional development will assist elementary math teachers in developing a tool kit of research-based strategies that meet the educational needs of their students. The professional development training will offer tools to improve math instruction with low-SES students in mind, while still addressing those external factors participants shared, which could also contribute to low achievement.

Review of the Literature

The literature review is presented in two sections. The first part focuses on professional development and justifies why this would benefit elementary math teachers as an appropriate tool in learning strategies to effectively teach math to low-SES students.

The second part of the literature review focuses on external factor themes that were introduced in the findings. Reviewing the literature on these factors was essential because teachers named them as potential causes that led to limited achievement of their low-SES students. This literature review was conducted using Walden University library's database. Electronic resources utilizing peer-reviewed articles were found. Academic Search Complete, ERIC, Education Research Complete, ProQuest, and Education from SAGE were the major sources used for the search. Search terms included *professional development*, *math professional development, teacher training, math teacher training, learning*, *math, disadvantaged students*, *adult learners*, *parental support*, *math anxiety*, *pre-K math, at risk*, *differentiation*, and *effective math instruction.*

Connecting Other Related Themes to the Professional Development

The professional development series for this project is entitled *Effective Instructional Strategies to Support Struggling Math Students*. The session topics were chosen to address the findings from the data collected in the research study. There were three overarching external factor themes that I believed if addressed could support teachers with developing skills they needed to support their low-SES students improve in math. These themes were (a) gaining parental support and developing a positive relationship with parents around math, (b) addressing student math motivation, and (c) acknowledging student gaps in learning and the potential causes.

Parental Support of Math

An external factor theme identified was a lack of parental support when it comes to math including homework support. Gunderson, Ramirez, Levine, and Bellock (2012)

identified parental math anxiety based on their personal experiences learning math growing up as potential cause of their lack of support. Parents' personal feelings towards math could influence their child's perceptions and can also prevent them from being confident in their ability to help their child. Because children's attitudes result from environmental influences including interactions with their parents, it is vital that teachers are thoughtful about how they approach parents and find ways to be inclusive of parents in learning math (Gunderson, Ramirez, Levine, & Bellock, 2012). Vukovic, Roberts, and Green Wright (2013) stated that supporting families' involvement within their child's education is one method that can help close the achievement gap. Providing instructional demonstrations helps removed barriers for parental support and allowed parents to realize their role in shaping their child's development as a result forming a strong partnership between home and school (Lewis, Kim, & Bey, 2011). In addition, Soni and Kumari (2015) suggested math intervention programs for parents as well as awareness efforts put in place so parents can begin to shift their own thinking around math thus providing more positive exchanges for their children.

Student Motivation in Relation to Math

Student motivation was also a theme identified that effected student math achievement. Students who struggle in math will more than likely become frustrated and loose motivation to overcome challenging math situations. Wang et al. (2015) defined math motivation as "the extent to which individuals embrace math challenges, value the importance of math abilities, and are motivated to perform well in math" (p. 1864). Ramentol (2011) defined motivation as "the energy that inspires humans to achieve a

goal" (p. 28). Ramentol created a study based on the idea of a math day where the main objective was to improve student math motivation and get students and teachers to enjoy math through a variety of game based learning activities. Students who have high levels of motivation tend to be more invested in math thus attempt to overcome challenges and have better results over time than students who have low motivation. Students are also motivated to learn material they think will be of value to them in the future (Cetin-Dindar, 2016). Colgan (2014) shared "the most obvious starting point to improve student engagement and investment is to embed mathematics within an appropriate and fascinating context: making the tasks realistic, relevant, and stimulating, and the focus, fresh and purposeful" (p. 11). Therefore, it is important for teachers to take student motivation into account and find ways to make math enjoyable for all students while keeping tasks moderately challenging for low-SES students so they do not give up and obtain motivation in working hard to improve their math learning.

Access to Educational Resources

Another external factor theme related to achievement was access to educational resources. Children from minority and low-income families have lower performance levels in science, language, engineering, technology, and math (Kermani & Aldemir, 2015). Some students from these backgrounds did not have access to early learning programs such as Headstart or Pre-K. Magnuson and Waldfogel (2016) found that children from low-SES backgrounds showed the largest academic advantage from taking part in such programs because they were less likely to have comparative learning experiences in their home environments. Teachers must therefore make efforts to

understand the learning landscape of each of their students. Barnett (2011) suggested early educational intervention as a way to counterbalance the impacts of poverty and insufficient learning settings of low-SES students. Armed with this knowledge, teachers can begin the work of filling math gaps early thus improving the goal of getting their low-SES students caught up to grade level expectations quicker. I selected differentiation as an effective teaching strategy to support this goal.

Professional Development

Professional development is a way professionals improve their skills and demonstrate growth in their chosen field. Educators use professional development to enhance their teaching performance and increase student achievement (Guskey, 2014). School districts regularly support educators by providing professional development opportunities targeting expanding educator's performance levels (Lehiste, 2015; Mizell, 2010). According to Stewart (2014), teacher participation in professional development increases once they have a vested interest in the topics they are engaging. Based on the findings of this project study, elementary math teachers conveyed the need for more professional development targeted towards effective math instruction for low-SES students.

Researchers have found that effective professional development relies on effective design and implementation. Successful math professional development that improves teacher practice and content knowledge is more likely to improve student achievement (Gerber, Marek, & Martin, 2011). Researchers have suggested several guidelines that if followed lead to a sound foundation upon which to plan professional

development opportunities. For example, Darling-Hammond, Wei, Andree, Richardson, and Orphanos (2009) suggested professional development should:

- be intensive, ongoing, and connected to practice;
- focus on student learning and address the teaching of specific content;
- align with school improvement priorities and goals; and
- build strong working relationships among teachers.

For professional development to lead to positive learning outcomes for educators, effective planning is essential (Guskey, 2014).

Professional development experiences that teachers can apply to their individual classrooms build a sense of accountability and have been identified as more effective than those that do not (Gibson & Brooks, 2012; Riggsbee, Malone, & Straus, 2012). Gokmenoglu and Clark (2015) stated that teachers want to be active participants in their development so providing activities in which they can engage and collaborate is vital (Bayer, 2014). Kazempour (2009) also insisted that any professional development provided to teachers must allow time for teachers to reflect and involve them as active participants. As teachers reflect, they must be able to be able to determine how the professional development impacts their current practice and make connections to ways it can be improved (Linder, 2011). According to Killion (2012), teachers can more effectively support common goals after participating in professional development.

However, while it is important to address teachers' desires it is equally important to connect professional development to school wide and district goals (Guskey & Yoon, 2009). Linking professional development to appropriate school targets or district

initiatives gives teachers the perception of implied importance and will help attribute more value to the learning experience (Baeder, 2010; Sandholtz & Scribner, 2006). The evaluation and reflection of one's practice towards normed goals can also create positive organizational change across the school (Lafortune, 2009). Factoring in teacher preparation is closely linked to teacher effectiveness (Sleeter, 2014). By design, ensuring alignment between teacher needs, effective preparation, and school focus areas increases the chances that professional development is purposeful (Sparks, 2002). Therefore, these shared learning experiences tied to higher organizational aims lead to lasting personal modifications in one's practice and development.

Professional learning communities (PLC) provide a space where teachers can synthesize the content learned through professional development and work collaboratively to meet learning objectives tied to their individual development and collective school goals. PLCs help improve teaching practices and instruction to accomplish higher levels of student success (Hill, Beisiegel, & Jacob, 2013). Math PLCs in particular help build improved teaching practices but also consistency of practice with a focus on teacher synergy and communication thus improving teaching and learning across schools (Haar & Foord, 2013). Rivernos, Newton, and Burgess (2012) detailed the value of PLC members taking time to reflect upon what they would be teaching and how it would be delivered in advance of being in front of students. Taking time to do this reflection and evaluation piece gave teachers the chance to receive feedback and support from peers on their teaching practice. According to Burke (2013) a systematic approach

to collaborative feedback and support linked theory to practice and is valuable to push the mutual growth of novice and veteran teachers.

Teacher Practice and Feedback

Reflection on practice is a tool used by effective teachers to improve their teaching. Successful reflection coupled with direct action leads to changes in practice (Crichton & Gil, 2015). Based upon the research from this project study, teachers communicated a need for time to engage in practice with the common core math standards and receive feedback on the delivery. Cole (2012) agreed professional development opportunities should include: (a) actual teacher practice rather than explanations of practice, (b) opportunities for observation, critique, and reflection, (c) opportunities for group support and collaboration, and (d) deliberate evaluation and feedback from skilled practitioners with expertise about good teaching. Cole also suggested that professional development focus on the implementation and mastery of teaching plans and techniques. Teachers shared they wanted time to practice as a group before presenting material to students to ensure clarity and cohesiveness. Voerman, Meijer, Korthagen, and Simons (2104) started that the impact of professional development is limited if there is no reinforcement of learned skills. Teachers need to feel supported and through practice and feedback they can become confident in the content they are teaching.

Teachers build confidence in an environment where they are free to take risk and honestly share areas of improvement. One way to create this environment is to build a system of regular practice and feedback. Daniel, Auhl, and Hastings (2012) discussed the

process of providing consistent feedback in collaborative setting, which leads to the creation of a collective effort to critique and grow. If teachers practice the correct way to teach a standard and deliver a lesson, they are more likely to apply those same lessons learned when they are in front of their students. An environment where feedback is regularly given helps shift teacher beliefs and increases student success (Borg, 2011)

Differentiation

Differentiated instruction supports the concept that all students can learn no matter your background. The current classroom dynamics has vastly changed in terms of culture, linguistics, background knowledge, cognitive ability, and learning preferences, which create an environment where multiple strategies need to be taught, based on the various learners in the room (Simpson & Bogan, 2015). Tomlinson and McTighe (2006) stated "Differentiation instruction focuses on who we teach, where we teach and how we teach. Its primary goal is to ensure that teachers focus on processes and procedures that ensure effective learning for varied individuals" (p.3). With the changes in classroom make-up and the diversity of students served, differentiation allows teachers the opportunity to reach all their learners. A differentiated instructional approach pushes teachers to acknowledge their students varied learning capabilities and design instruction that meets each need.

In a differentiated classroom the focus is on creating the best environment to address student needs that is varied based on interests and assignments with the goal of improving student learning (Levy, 2008; Smit & Humpert, 2012; Zimmerman, 2010). Smit and Humpert (2012) believed that classrooms where differentiation is used not only

do students grow academically but their confidence also increases. Acknowledging modifications that build on students' strengths and varying abilities help students develop different pathways to find math solutions (Baker & Harter, 2015; Cowan et al., 2011). Differentiated math instruction would definitely support struggling students especially from low-SES backgrounds because of the focus on techniques that work best for them.

Landrum and McDuffie (2010) suggested that while teachers work to create a differentiated environment based on content, process, or products it is pertinent to also think about differences in student readiness, learning profiles, strengths, needs, and interests consequently targeting true individualization. Dixion, Yssel, McConnell and Harding (2014) stated differentiated instruction is only effective when educators are actually able to meet and accommodate the needs of all their students. According to Scott (2010) this process of knowing your students and carefully collecting actionable information on how to best support them is not something that can be taught in one professional development session but it is rather a skill that teachers must develop over time in a collaborative environment such as a PLC. In a PLC, teachers meet to discuss teaching techniques, review student data, and make plans for future instruction for students who need to be re-taught lacking skills (Nyberg, 2014). When thinking of planning for differentiation teaching techniques, Brighton and Wiley (2012) provided four key questions teachers can ask to help lay the foundation for differentiated instructional thinking that has been used in pull-out reading programs but are now being applied to math. The questions are (a) What do you want students to learn? (b) Where will learning take place? (c) How will you get them to learn it? and (d) What will be the

results or product of the students' interactions? Taking time to think through each of these questions helps provide a starting point for teachers to practice the components of differentiated instruction.

Project Description

Potential Resources and Existing Supports

The success of this professional development depends on partnership between the facilitator and principal. The principal and facilitator will need to confer on the time and date of the professional development as well as the location and materials needed. Existing supports would include the space allocation, chart paper, writing utensils, access to a project, a printer for making session copies, pens, markers, reflection journals, and seating arrangement ideas to maximize participation while limiting the potential for cliques to form. Teachers will need to come prepared with copies of their math standards, math curriculum, student information sheets or rosters, and school issued laptops.

Potential Barriers and Solutions

A potential barrier is teacher cooperation because the professional development will cut into their preplanning time over the summer. Terhart (2013) discussed the difficulty in estimating the success or failure of educational improvements due to teacher resistance. Teachers might be resistant and less participatory because they might perceive it as one more thing that hinders them from more salient work they could focus on from their back to school to do lists. To combat this, the principal needs to ensure teachers understand that they will have time to do some action planning and collaborative work

around topics discussed in the professional development that will help get their math instruction and family outreach off to a great start which in the end is a value add.

Another anticipated barrier is having time to teach the material while allowing participants time to engage in discourse. Allowing teachers to create new understanding is dependent on the collaboration of ideas and involves shared interactions with others (Littleton & Mercer, 2013). As healthy debate and conversations ensue, sometimes they can also derail the agenda. Using a timekeeper, establishing norms, organizing a parking lot, and utilizing reflection journals will help keep everyone on track.

Proposal for Implementation and Timetable

The professional development will be a 3-day series offered during summer preplanning in July or during the first trimester in August giving teachers the opportunity to use the information they find about external factors during mandatory home visits also scheduled during the first trimester. A variety of tools will be used to actively engage teachers during the professional development such as a PowerPoint presentation, reflection journaling, variety of guided discussions both whole group and small group, video segments, and collaborative planning time. Appendix A outlines the agenda and order of the professional development.

Roles and Responsibilities

The role of the facilitator is to present the presentation and guide teachers in productive discourse aligned to the outcomes of the professional development. The role of the principal is to support the facilitator in securing the resources needed to conduct the professional development and provide feedback. The role of the teachers is to

participate and successfully complete the tasks outlined, provide feedback to the facilitator, and incorporate planned action items into their teaching practices and lesson planning.

Project Evaluation

During key points the facilitator will do formative evaluations where teachers will have opportunities to share feedback in the moment on the training. At the end of each day, teachers will be given an opportunity to share feedback about the strengths and weaknesses of the training. These formative evaluation checks will help the facilitator made immediate changes to improve the professional development if necessary. After the last session teachers will be asked to fill out a survey providing summative feedback on the overall training. The summative evaluation through survey will assess if the goals of the project were met in terms of preparing teachers to incorporate differentiation, explicit instruction, and motivation techniques into their lesson plans. Zepeda (2012) stated this type of evaluation process helped address day-to-day implementation of trainings and collecting summative data supported modifications, continuation, or termination of professional development. The feedback provided will help the facilitator make adjustments to ensure the quality of the training accurately supports teachers in meeting the targeted outcomes. The key stakeholders include participating math teachers, administrators, the counselor, students, and parents. Other stakeholders might include the parent-teacher-organization, parent liaison, and community organization that support parent outreach.

Information gathered from the formative and summative assessments will determine if the three professional goals were met. The first goal of teachers being able demonstrates knowledge of differentiation, explicit instruction, and student motivation will be evaluated through summative and formative assessments. The summative assessment for differentiation is the jigsaw activity where teachers are asked to pull out key components of differentiation based on article readings and share with their teams. The formative assessment for explicit instruction is the teachers' guided notes from the explicit instruction video and the summative assessment is the 30-second video ad teams will create to explain one component of explicit instruction and how it applies in the classroom. During the sentence strip and chart activity teachers will discuss how students feel about math and ways in which they want their students to feel. This will serve as the formative assessment for student motivation.

The second goal of teachers incorporating differentiation, explicit instruction, and student motivation into their lesson planning will include a summative assessed where teachers work in collaborative groups to plan for their first math unit and applying skills learned over the 3-day PD. If teachers are successfully able to create a math unit plan with regards to differentiating for students, using explicit instructional techniques, and addressing student motivation, the facilitator will be sure this goal has been met.

The third goal teachers collaborating on ideas on how to increase parent involvement and address student lack of access to educational resources will be formatively assessed through observations of participants' interactions and conversations. The summative assessment would include the creation of the math night for parents that

addresses improving parent relationships and providing resources to support student lack of resources at home.

Project Implications

Social Change

This project addresses the factors that affect the math achievement of low-SES students. Finding research-based best practices to teach math and addressing external factors will help close the achievement gap these students face. Williams (2011) affirmed that districts must ensure educators have access to high quality professional development targeting effective teaching techniques as well as provide time for collaboration and planning to close the gap. A professional development series targeting effective teaching practices that also addresses external factors while providing space for teacher collaboration and planning is aligned to a productive effort in closing the achievement gap for low-SES students.

Local Community

The local community is comprised of several stakeholders (students, teachers, and parents) who have a vested interest in all students having academic in success regardless of socioeconomic status. Teachers would acquire knowledge on valuable research-based teaching techniques and strategies on supporting the whole child as a result of this project implementation. Students from low-SES backgrounds will have increased levels of achievement in math based on targeted support and math intervention strategies aligned to their unique needs. Because math objectives are related to building blocks, students will be able to create a strong mathematical foundation to ensure mastery and retention of

skills, thus, closing their achievement gap. Last, the goal is that parents will feel a partnership between home and school as well as obtain support in overcoming barriers to successes in math resulting with them being able to confidently support their child.

Far-Reaching

As teachers start to see increases in math achievement and begin to share these research-based math practices in addition to collaborating across schools, other teachers will begin to incorporate these ideas into their practices. This has the potential to reach across other districts and become a part of California's future initiative. The ramifications for success for students are even greater. As the achievement gap starts to close, more opportunities for low SES to gain better economic positioning for their families as they push for college bound targets. Once obtaining a college education they are on track on finding better career opportunities with higher paying salaries to uplift their families and their communities.

Conclusion

In this section, a comprehensive professional development project was outlined based on interview data analysis from 10 participant interviews and lesson plan document review. The themes that emerged from the data analysis were connected back to the research questions. The professional development project created addresses the gap in practice of research-based strategies to teach low-SES students and effective math professional development. A literature review, implementation plan with barriers addressed, evaluation procedures, and implications for social change were also shared.

Section 4 analyzes the project's strengths, limitations, scholarship, and impact on future research. The full project is included as Appendix A.

Section 4: Reflections and Conclusions

Introduction

The purpose of this qualitative case study was to explore elementary teachers' perceptions of staff development, strategies, and modifications that support low-SES students' math instruction. This study was specifically conducted to generate a deeper understanding of the gap in practice between a California public school district's shift to the common core state math standards and the professional development teachers needed to support low SES math skill development. The data collected from the qualitative case study suggested there is a need for targeted professional development based on the topics shared to increase teacher awareness of best practices for reaching struggling math students but also respects the distinctive needs of low-SES students.

In this section, I share a project for a professional development series that provides training on research-based best practices for reaching struggling math students, which could also be applied to supporting students from low-SES backgrounds. The training also establishes strategies to address external factors that can lead to underachievement for these students. I also discuss the strengths and limitations of the project as well as alternative methods that could be used to address the problem. Finally, I share my reflections on leadership, scholarship, project development, and my role as a practitioner.

Project Strengths

The project design has several strengths in addressing the needs of teachers and students. One of the strengths found in this project was the acknowledgment of the external factors that students from low-SES backgrounds face that impact math achievement. Challenging teachers to think about social factors outside the classrooms helps them empathize with their students and become solution oriented in tackling barriers to students' success. Jeynes (2003, 2005, 2007) stated parental involvement has an impact on student academic success and overcoming parental barriers in turn leads to their children overcoming barriers to success which leads to increased student achievement and confidence.

Another strength of this project is that it will provide teachers actual tools and resources they can use to support student learning in the classroom. The first teaching strategy focuses on differentiation and the importance of reaching all types of learners that fall at various levels. Tomlinson (2000) stated that differentiation is defined by the efforts teachers put in place to meet the individual needs of each learner in the classroom. This approach to teaching recommends teachers make adjustments to the content, process, product, or learning environment to maximize each student's learning potential. The second teaching strategy focuses on explicit instruction and ensuring all students can achieve math proficiency. Doabler and Fien (2013) specified three key elements of effective explicit instruction:

- Teacher modeling that is clear with consistent wording, clear explanations/demonstrations, and can include think-alouds.

- Guided practice should sequence the instructional examples, preteach prerequisite skills, include verbal prompts, conclude with a cumulative review, and have math models.
- Academic feedback should be ongoing, timely, corrective, and positive.

The study participants also revealed a need for collaboration in determining how to best support their struggling math students and what strategies work best. Using their collective efforts helps build teacher efficacy and drives towards a common goal (Petrie & McGee, 2012). The creation of a professional learning community (PLC) through the professional development activities helps set up a culture of collaboration through common planning and ongoing support (Croft, Coggshall, Dolan, & Powers, 2010). The project study was therefore designed to create an environment in which math teachers can learn from the expertise of one another on an equal playing field.

Project Limitations

The primary limitations of this project are time and resources. The educators engaging in this professional development workshop will need time to effectively plan for lessons using all the tools they have gained. The planned three days of professional development are not sufficient time to create math lesson plans for an entire year. Therefore, participating educators will need additional time throughout the year to plan lesson plans to accompany each new math unit. Teachers will need time to review standards, craft lessons, plan differentiation approaches, recreate exit slips and assessments to match student needs. Teachers will also need to time to analyze data and

create action plans for students who are still struggling with the information pulling from the accessibility tools used during the professional development.

Recommendations for Remediation of Limitations

One recommendation to remediate the time limitation is for the administrative team to find additional time in the staff meeting schedule to provide teachers planning time to plan lesson plans and remaining math units. One suggestion is to use the top of each staff meeting to disseminate information and then the rest of the meeting time would be dedicated as planning time for content teachers. Since common planning time may not be sufficient, a combination of allotted time during staff meetings needs to be shared. During summer planning, grade level chairs, the math specialist, and members of the administration team need to meet to calendar out math planning time. This will preferably occur before each math unit to ensure successful implementation of the strategies learned.

Another way to circumvent the time limitations is to have Saturday planning days throughout the year. If the administration team provided food and access to the school, the math teams might be willing to meet. The concern with this solution would be for schools that have union restrictions. There might need to be additional provisions put in place for willing union teachers to access this option. For nonunion schools, administration teams might be able to provide a small stipend for the planned units or no cost items such as a free jeans day, leaving early from work, or having an extended lunch break.

Scholarship

Several factors have helped me gain perspective on the topic of math instruction: pursing a doctoral degree, moving into a full-time school administrator role, and being a parent of a special needs child. I have noticed a deep saturation of professional development support for literacy teachers and building foundational skills for reading but not the same level of support for math instructors. Hence, this reason and the need for additional resources for supporting struggling math students from low-SES backgrounds became my main focus.

During this process, I have learned how to conduct a research study and prepare a professional development series that addresses the gaps in practice identified in the data analysis phase. As a school leader, it is important to not only step back and analyze local problems but also find solutions to tackle them. Passing on the knowledge gained from the research I have been engrossed in can be used to support math teachers across the nation which in the essence of true scholarship. It is very important to me to know that my research can be used to support educational reform in supporting not only low-SES students but their families as well.

Project Development and Evaluation

The project was developed from the analysis of the research conducted from the teacher interviews. The awareness that teachers wanted to support low-SES students but did not always know what tools would work best and their feelings of inadequacy due to the limited math professional development provided to them became the focus. Advice from my chair, committee member, and university research reviewer helped me to

expand my writing to produce a well-organized project cultivated from the themes through inductive data analysis. I created a professional development outline that targeted those major themes. I also reflected on my past professional development experiences and ensured that I not only included a variety of professional development activities but also allotted time for teachers to plan and collaborate with one another. Another important component were the journal reflections that occurred throughout the professional development series. These reflection moments targeted both teachers' current practice and student outcomes. Connecting teacher actions to student outcomes helps show teachers the meaningfulness of the work they do every day and helps solidify the usefulness of the professional development.

Creating an evaluation system for this project study is important in determining its effectiveness in meeting teachers' needs and the success in meeting the intended outcomes. The summative evaluation of the project's effectiveness will be based on a teacher survey that will be given at the completion of the professional development series. However, formative evaluation measures are also included through a teacher reflection form at the conclusion of each day's activities and results addressed at the top of each morning. The purpose of the formative evaluation is to make quick adjustments each day to ensure teacher satisfaction and to collect information for future presentations. The summative survey helps to identity the overall project's success and if the desired outcomes are not achieved then the project will have to be revaluated and adjusted for improvements before future delivery.

Leadership and Change

It is vital for school leaders to implement changes that will address learning gaps in their schools and support teacher content knowledge development. As a current school leader, I understand the importance of using inquiry techniques to identify areas of improvement for both students and teachers. Working on my project helped push me into the solutions oriented side of educational problem solving. While many educators are apt at identify problems within our education system, it takes a research practitioner to work on solving these problems. As a result of going through this process, I have become a confident leader who is willing to share her opinions and back them up with research-based approaches. Through this study, I have also gained insight into factors that low SES families face as well as deepened my own knowledge of best practices to support struggling math students whether they are from low-SES backgrounds or not. This project can help influence change in how school communities work with low-SES students and their families and promote change in how we support this population of students.

Analysis of Self as Scholar

Reflecting on my work through this project, I have developed my skills as a researcher through conducting literature reviews to defend my position, using conceptual frameworks to guide a study, analyzing data, and ensuring validity measures. I have also developed my writing skills to coherently communicate ideas and to write with clarity for an intended audience. As a Walden student, I deeply understand the goal of social change and I am committed to continuing to expand my knowledge base as I support others in

solving problems at the local level to create change in any school environment I am placed. Through my work with Walden, I have obtained the respect of my colleagues and peers and have been asked to support teacher professional development training at the district level. I believe my experiences and willingness to share what I have learned enabled them to respect me as a scholar and practitioner.

Analysis of Self as Practitioner

This project helped evaluate my approach to becoming a better educator, researcher, and school leader. I have a renewed knowledge base from the various course readings, research, and through the completion of this study. My ability to critically review research helps me identify quality articles and studies to share with my staff that helps build their content or pedagogical knowledge as well. Conducting home visits was a suggestion that came from my research and has helped shaped my view on low-SES students and the challenges the face. These experiences help me support these families and shift teachers' paradigm in how they address these families and their children.

I am also motivated as a practitioner to find ways to close student learning gaps. One way to do this is through differentiation. While I knew the basis of differentiation, I was more versed in how to differentiate for reading. My work on this project allowed me to delve into differentiation techniques for math students. I was able to learn about a student math difficulty and find ways to match supports in the classroom. The power behind meeting each student's needs and allow them access to complex math content is a game changer for not only struggling students but also those from low-SES backgrounds.

Analysis of Self as Project Developer

As a project developer, I enjoyed taking time to design a professional development series aimed at supporting early childhood educators learn research-based practices to support struggling students. While the focus of my research was targeting low-SES students, any student struggling in math can benefit from the strategies suggested in the study. While teachers are regularly engaged in professional development activities for multiple content areas there was a need to create a professional development series that effectively targeted teacher needs. Teachers wanted time to learn about effective math strategies but also have time to collaborate and plan to infuse the strategies into their lessons. It was important for me to include not only the math research information but also provide segments of time to plan math units and infuse collaboration that will lead future professional learning communities within the school.

Reflection on the Importance of the Work

As I reflect on the importance of this research study, I am reminded of the sacrifices my family and I have made. I also recall the moments I felt discouraged and overwhelmed as I moved from a teacher into the role of a school leader. There were many barriers and I felt like giving up. Yet, I learned the power of time management and perseverance to meet my goals. In order to get through a doctorate program, you must have a strong support system. My family, colleagues, chairs, and fellow classmates reminded me constantly that the light was just at the end of tunnel. Knowing that the results of my study could potentially make a difference in not only students' lives but also how teachers are developed drove me to push through the tough times. The idea that

my research can be added to the body of research for math instruction and supporting low-SES students is inspiring.

The Project's Potential Impact on Social Change

The professional development will create social change by providing teachers with the tools they need to effectively plan math lessons using research-based best practices. Many times students from low-SES backgrounds are left behind in math because they struggle to grasp concepts and do not have the prerequisite skills they need to be successful. There is a myriad of factors that could cause this to occur. This project provides information on some of these external factors as well as supports to put in place to gain higher achievement levels from these students including differentiation. In addition, the use of teacher collaboration helps ensure lesson plans and unit plans are shared so all students at the school benefit from the strategies being put to use. The district will benefit as student achievement increases also the ranking of AYP increases to the point that some schools may get off the needs improvement list. Finally, the research paper has the opportunity to generate conversations of math leads and math instructional coaches to evaluate their practices in regards to how they support teachers, students, and families when it comes to the common core standards and math equality.

Implications, Applications, and Directions for Future Research

This study is significant to math educators with students from low-SES backgrounds. It provides research on reason why there is an achievement gap including external factors and strategies that can help close the gap. The project study recommended utilizing differentiation and accessibility instructional techniques to

support low SES in math as well addressing external factors that may cause low achievement. A professional development series providing research-based math instructional tools and how to use them was created, as well as, designated time to collaborate with peers to craft math lesson plans including these tools. School administrators will also find this study significant because closing this achievement gap also helps schools reach their AYP goals.

Future research can be developed into supporting students beyond early elementary grades. Some of the strategies shared within this study might be able to be used or adjusted but there may be additional tools to use as students get older and work more independently. Additional research can also be applied to the external factors that affect low SES student achievement. While this study touches on this topic of parental support and student motivation, more development can be utilized in this area. Finally, additional research can be used to compare student achievement in math from low SES background versus struggling math students from other backgrounds. Differences and trends could help refine math instructional tools even further than what was provided in this research study.

Conclusion

To conclude, I have learned a great deal about scholarship, project development, and my role as a practitioner. This section reviewed the strengths and limitations of the project as well as implications for social change and future research. Researching this topic allowed me to understand factors that contribute to low SES student lack of math achievement and the need for teachers to be equipped with professional development

aligned to support their struggling math students. The project was designed based on the results of the data collected and will provide early elementary teachers the research-based math tools they need to deepen their instructional knowledge to help their struggling math students succeed. Promoting successful learners helps not only close the achievement gap but also creates confident students able to overcome any challenges they may face in life whether or not they are from a low SES background.

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Appendix A: The Project

Guiding Struggling Math Students Toward Success

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October 2016

Introduction

The professional development is entitled "Guiding Struggling Math Students Toward Success." The purpose of this professional development training series is to create teacher development on strategies and modifications that support low-SES students' math instruction. The professional development series consists of three days of activities designed to provide tools for elementary math teachers to help close the achievement gaps of low-SES students and struggling learners. The teachers will be introduced to the concepts of planning for differentiation in the math classroom, accessibility strategies targeting how to reach a variety of learners, how to teach using explicit instruction, strategies to increase student motivation, and information on external factors such as parent involvement and limited student access to educational resources. The professional development sessions will begin at 8:30 a.m. and end at 3:00 p.m. on the date that will be determined by the school district administration. An opening activity is scheduled from 8:30 a.m. to 9:00 a.m. which includes looking at the reflection forms from the previous day and addressing any lingering questions to close the feedback loop as well as share ah-ha moments to increase teacher investment. A parking lot chart will also be utilized which is a large chart paper on the wall used to capture questions and feedback during break times. An official survey will be given at the end of the last day to provide feedback on the overall effectiveness of the professional development using survey money.

Goals

The goals of the professional development series are as follows:

- Goal 1: Teachers will demonstrate knowledge of strategies for implementing differentiation, explicit instruction, and student motivation.
- Goal 2: Teachers will incorporate differentiation, explicit instruction, and student motivation into their lesson planning.
- Goal 3: Teachers will collaborate on ideas on how to increase parent involvement and address student lack of access to educational resources.

Learning Outcomes

During this professional development series, teachers will:

- Define differentiation and develop lesson plans reflecting differentiated math lessons based on content, product, process, and learning environment.
- Identify components of explicit instruction and incorporate them into daily math lesson plans.
- Understand external factors that affect student learning.

Audience

The primary focus audience for this professional development series will be elementary math teachers who work with low-SES students and/or struggling students.

Table 4

Professional Development Timeline

Time	Day 1	Day 2	Day 3
8:30-9:00	Introductions, norms, distribution of notebook gift.	Introductions new facilitators/teachers and share out from reflections or evaluation.	Introductions new facilitators/teachers and share out from reflections or evaluation.
9:00-9:30	Reflection notebooks – reflect on struggling math students and put a face to our concerns.	Reflection notebooks – think of lesson that went well versus a lesson that bombed. Discuss lessons learned.	Reflection notebooks –think of a parent and how do they affect you a particular student in the class.
9:30-10:00	Session 1: Discussion of differentiation and what it means to teachers. (picture draw activity & share)	Session 3: Explicit Instruction (video stops and talks + chart) Teachers take guided notes. Teachers make 30 sec ad spot to explain one component of explicit instruction and how it applies in the classroom.	Session 5: External Factors Parents (Video) Teachers share how they cultivate relationships with parents and support them.
10:00-10:45	Jigsaw article on two differentiation articles to find key components of effective differentiation.		Create a math night for parents, what would you share? Work in grade level groups. Think of what bias you want to address from video.
10:45 – 11:00	15 min break	15 min break	15 min break
11:00-11:30	Presentation on how to teach math and differentiate.	Work Time: teachers use this time using the 6 components of explicit instruction to plan out a lesson in collaborative groups. Share out example lessons and teams provide feedback.	Session 5: External Factors Access (PDF) Teachers will read PDF and within teams choose an area to present and share solutions. Teachers plan out additional questions to ask during home visits to create learning profile for students on roster.
11:30-12:15	Activity: Matching game (process, product, content) Teacher chooses one standard and plan out how they can differentiate.		
12:15 -1:15	Lunch	Lunch	Lunch
1:15-1:45	Session 2: Accessibility Strategies Video + Reflection (TPS)	Session 3: Student Motivation Reflection books – what do students say negative about math versus what do you want them to say. (strip activity)	Teachers play kahoot game on topics covered over 3-day PD and end with a raffle.

		Chart and explain how this applies in the classroom environment.	
1:45-2:30	Review Math Accessibility PDF and teachers pull out names from earlier reflection and select activities that would support those students on graphic organizer. (see video example) Teachers provide feedback to each other.	Presentation: How to motivate students making math fun.	Work Time: Teachers work in collaborative groups to plan for their first math unit and applying skills learned over the 3-day PD.
2:30-3:00	Wrap up, reflection, evaluation	Wrap up, reflection, evaluation	Wrap up, summative evaluation

Day 1: Reaching All Learners

Goal 1: Teachers will demonstrate knowledge of strategies for implementing differentiation, explicit instruction, and student motivation.

8:30 – 9:00 Introductions and Icebreaker Activity

Participants will be asked to fill out name tags that include their name, role, years of teaching experience, and a fun thing they did over summer break. The facilitator will share their name tent last and give background information on the professional development series including why this was chosen as a research topic. The facilitator will then review the norms and ask the participants if they would like to make any additions. Finally, the facilitator and administration team will pass out the teacher reflection journals provided by the school as a gift to the participants.

Facilitator Notes:

1. Have name tags available at each seat. Include various shapes in the corner of tents to help with groupings for discussions later.
2. Have participants share the four facts.
3. As teachers share their years of experience pass out colored stickers (0-3, 4-7, 8 and up). This will be used for later discussions to vary the experience per group.
4. Ensure each person shares and completes all components of the tent.
5. Materials –cardstock, markers, stickers

9:00 – 9:30 Morning Reflection

Participants will write a reflection about their struggling math students. They will be asked to identify which students struggle in their math class and list some potential causes. The goal is to put an actual face to their concerns and make the work they engage in today purposeful.

9:30 – 10:45 Session 1: Differentiation

9:30 – 10:00 **Activity 1:** Participants will be asked to think of all they have learned about differentiation in the past. They will think about what their definition of differentiation is, what it means to them as an educator, and how they demonstrate this in their classrooms. They will draw a picture that captures all this information and must be prepared to share their masterpiece.

Facilitator Notes:

1. Have teachers work silently and independently on this task.
2. Play some instrumental music in the background.
3. Teacher will share speed-dating style where both rows rotate. Row 1 rotates to the right and row 2 rotates to the left.
4. Materials –white copy paper, markers, crayons,
5. Give 10 minutes to complete the activity and 5 minutes per each rotation
6. Question last 5 minutes: What were the similarities and differences in responses? Did anyone hear something unique?

10:00 – 10:45 **Activity 2:** Participants will complete a cooperative reading on two differentiation articles. The teachers will read their assigned section independently looking for five key points they think are significant to share with the group. Then they will share their five important points within their small groups and then collectively narrow down so the entire small group has agreed upon the five key points they will share with the whole group. Each table group will then present on their highlighted points from their team summaries. The chosen articles will focus on readiness, interests, student learning profile, and the components of differentiation (content, process, product, and learning environment).

Facilitator Notes:

1. Assign teachers chunked reading sections.
2. Follow the jigsaw protocol sharing in small groups then whole group.
3. Have a scribe capture key information from each group on chart paper.

Materials –chart paper, markers, copies of the articles Article #1: Tomlinson, C. (2000). Differentiation of instruction in the elementary grades. Retrieved from http://education.ky.gov

Article #2: Santangelo, T., & Tomlinson, C. (2012). Teacher educators' perceptions and use of differentiated instruction practices: An exploratory investigation. *Action in Teacher Education*, *34*(4), 309-327. doi:10.1080/01626620.2012.717032

10:45 – 11:00 15-minute break

Facilitator Notes:

1. Set up the PowerPoint presentation.

11:00 – 11:30 **PowerPoint:** Differentiation

The presentation will include a definition of differentiation by Carol Ann Tomlinson (2000; 2012) who is the lead researcher of differentiated instruction as well as the components of effective differentiation. The presentation will make use of the information teachers uncovered during the jigsaw article readings and close up any loose ends with how differentiated instruction can be implemented in the classroom.

Resource: http://files.eric.ed.gov/fulltext/ED443572.pdf

Facilitator Notes:

1. When applicable refer to the information recorded on the charts from the jigsaw puzzle and connect to it to the presentation.
2. Be sure to point of the parking lot for teaches to use as needed.
3. Materials –projector, laptop, power strip, and presentation

11:30 – 12:15 **Activity 3:** Participants will play a differentiation matching game based on the key points identified from the article readings and presentation for content, process, product, and learning environment. This will support teachers with gaining ideas on how they differentiate within their own classrooms. After the matching game, teachers will pull two math

standards and plan how they can differentiate for their students based on content, process, and product.

Resource: http://files.eric.ed.gov/fulltext/ED443572.pdf

Facilitator Notes:

1. Assign new groupings to make teams for the game.
2. Cut up the examples from the article and have teachers match them to the correct differentiation category.
3. Materials: index cards with sample activities, chart paper to collect final answers, tape, prize for the winning team
4. Circulate to support teachers as they plan to differentiate their two standards.
5. Ensure there is a mixture of experience at the tables during the planning portion.
6. Remind teachers to bring copies of their standards or provide website they can access them.

12:15 – 1:15 Lunch

Facilitator Notes:

1. Check the parking lot and ensure all paper materials are passed out

1:15 – 2:30 ***Session 2: Student Accessibility***

1:15 – 1:45 **Video:** Participants will watch a video on accessibility strategies to support students who struggle with accessing math content and engage in a roundtable discussion on their reflections from the video.

Resource: https://www.teachingchannel.org/videos/accessibility-strategies

Facilitator Notes:

1. Provide teachers 2 minutes to reflect on the video in their participant notebooks then share out within their small groups.
2. Pull from teachers whom you have not heard from to share out reflections in the whole group.
3. Materials –projector, laptop, power strip, and speakers

1:45 – 2:30 **Activity 4:** Participants will be given an accessibility strategies toolkit file full of tasks that address various student math difficulties. They will pull out the name of the student they wrote down during the morning reflection and match accessibility strategies targeting how to differentiate for that particular student.

Resources: http://www2.edc.org/accessmath/resources/strategiesToolkit.pdf

Facilitator Notes:

1. Prep graphic organizer for teachers to record the strategies they plan to use.
2. Ensure there are enough accessibility files for each teacher.
3. Teachers may take a break as needed.
4. Materials –graphic organizer and accessibility handout

2:30 – 3:00 **Close Out: Teacher Reflection Time**

Participants will fill out a 3-2-1-reflection sheet about the day's activities. This will include 3 new ideas I learned, 2 ah-ha's that popped in my head, and 1 question I still have.

Facilitator Notes:

1. Be sure to review the reflection sheets and address the questions participants still have the next day.
2. Materials –3-2-1 refection sheets

Day 2: Explicit Instruction and Student Motivation

Goal 2: Teachers will incorporate differentiation, explicit instruction, and student motivation into their lesson planning.

8:30 – 9:00 **Review Day 1 Reflections**

The facilitator will address the questions from yesterday's close out reflection and remaining parking lot items.

9:00 – 9:30 **Morning Reflection**

Participants will write a reflection about a lesson that went really well compared to a lesson that bombed. They will be asked to identify elements that attributed to the awesome lesson and list some potential causes of why the other lesson failed. The goal is to identify common components of great lessons and poor lessons. The facilitator will ask for groups to share out the commonalities in responses amongst the groups.

9:30 – 10:45 ***Session 1: Explicit Instruction***

9:30 – 10:15 **Video:** Participants will be asked to reflect on what they know about explicit instruction and a scribe will chart these items. Afterwards, a video will be shared that reviews the components of explicit instruction. Teachers will take guided notes and the facilitator will have planned stopping points to engage in discussion.

Resource: http://www.teachertube.com/video/math-explicit-and-systematic-instruction-243125

Facilitator Notes:

1. Stop after each main section and engage teachers in reflections on items they might have included in their classrooms or any ah-ha's.
2. Allow teachers time to fill in the guided notes page that highlights key points.
3. Materials –guided notes page, projector, laptop, power strip, and speakers

10:15 – 10:45 **Activity 1:** Participants will be asked to create a 30 second ad spot that illustrates their component of explicit instruction. The main components are: daily reviews, presentation of new content, guided practice, explicit feedback and correctives, independent practice, and weekly/monthly review. The more creative the better and the leadership team will help choose which group does the best job to win a sweet treat.

Facilitator Notes:

1. Split the group into 6 teams.
2. Be sure to explain the criteria for the ad. It must be 30 seconds and must contain elements from the video.
3. Pull teams out from a grab bag or hat.
4. Give teams 10 minutes to come up with ad and practice.
5. After each team presents provide 2 minutes to discuss the main elements of the components.
6. Materials –grab bag, index cards, sweet treats

10:45 – 11:00 15-minute break

Facilitator Notes:

1. Set out sample explicit instruction lesson plans/templates.
2. Post domain interest sign-up sheet (i.e. number sense and operations, data analysis, etc.)

11:00 – 12:15 **Work Time:** Participants will have work time to use the 6 components of explicit instruction to plan out lesson plans in collaborative groups. They will pinpoint a tricky objective that many scholars struggle with and apply what they have learned in order to teach it explicitly.

Facilitator Notes:

1. Allow teachers to work in groups based on math domains (i.e. number sense and operations, data analysis, etc.)
2. Have teachers sign up for domains during the morning break with a premade sign in sheet to make even groups. Once a group is full it is closed and teachers must select from a different group.
3. Materials –domain sign-up sheet, sample explicit instruction lesson templates

12:15 – 1:15 Lunch

Facilitator Notes:

1. Check the parking lot and ensure all paper materials are prepped

1:15 – 2:30 ***Session 2: Student Motivation***

1:15 – 1:45 **Activity 2:** Participants will begin with a journal reflection on negative

comments students make about math and positive comments they wished students said about math or have said. Two new scribes will be chosen and will chart negative comments on sentence strips under a sad face chart and positive comments on sentence strips under a happy face chart.

Facilitator Notes:

1. Have two different colored sentence strips (one for negative and one for positive).
2. Discuss negative comments first then positives and brainstorm why students might have these feelings.
3. Materials –sentence strips, happy/sad face poster, markers

1:45 – 2:30 **PowerPoint:** Motivating Students

The presentation will include a definition of what student motivation is and examples from a math classroom as well as a theoretical framework. Examples of fun ways to engage students in math that will lead to increased student motivation will also be shared. Provide example for three of the tips. Tip #2 usefulness of math – bring in sample store ads and illustrate for teachers how to select items for purchase to practice addition and money skills. The facilitator can also set up a fake grocery store where teachers use play money to purchase items with their table partners. Tip #5 incorporate technology – the facilitator will have the teachers go to http://nlvm.usu.edu/en/nav/vlibrary.html and have teachers review and practice on online manipulatives and connect this back to math

engagement. Tip #9 incorporate music into your lessons – the facilitator models with the perimeter song to the tune of "The Farmer and the Dell" with a selected shape on the board for the teachers to find the perimeter. Perimeter is all around / Perimeter is all around / Oh, oh, don't you know / Perimeter is around…/ You add up all the sides / You add up all the sides / Oh, oh, don't you know / You add up all the sides

Facilitator Notes:

1. Have teachers take notes on engagement modeled by the facilitator
2. Lead a discussion on additional strategies teachers have tried that are not on the list.
3. Materials –projector, laptop, power strip, and presentation

2:30 – 3:00 **Close Out: Teacher Reflection Time**

Participants will fill out a 3-2-1-reflection sheet about the day's activities. This will include 3 new ideas I learned, 2 ah-ha's that popped in my head, and 1 question I still have.

Facilitator Notes:

1. Be sure to review the reflection sheets and address the questions participants still have the next day.
2. Materials –3-2-1 reflection sheets

Day 3: Explicit Instruction and Student Motivation

Goal 3: Teachers will collaborate on ideas on how to increase parent involvement and address student lack of access to educational resources.

8:30 – 9:00 **Review Day 1 Reflections**

The facilitator will address the questions from yesterday's close out reflection and remaining parking lot items.

9:00 – 9:30 **Morning Reflection**

Participants will write an open reflection about their students' parents and all the ways they think parents affect their students. The goal is to see initial teacher views on the parent-student relationship. They will share one piece of information or experience from their journal with their elbow partner.

9:30 – 10:45 ***Session 1: External Factors: Parental Support***

9:30 – 10:00 **Video:** Participants will first reflect on how they cultivate relationships with parents and how they support parents. Afterwards, two videos will be played and teachers will be asked to reflect on them in their participant notebooks. Video #1 discusses positive relationship building around culture/behavior and teachers will be asked how those strategies can be transferred to a content area like math. Video #2 discusses parent reactions to common core math and teachers will be asked how they might overcome negative parental views.

Resource: Video #1 https://www.youtube.com/watch?v=vbyhao0FtaQ

Video #2 http://www.cc.com/video-clips/nemi1a/the-colbert-report-common-core-confusion

Facilitator Notes:

1. Teachers can be pushed to share with whole group.
2. Materials –projector, laptop, power strip, and speakers

10:00 – 10:45 **Activity 1:** Participants will work in grade level teams to create an action plan for a math night for their parents. They will focus on winning over parents who might have similar views to video #2 as well as other math biases they might have to overcome.

Facilitator Notes:

1. Split the group into grade level teams.
2. Ensure teachers have a clear plan including what activities and investment strategies they would use as well as a date based on the current school calendar.
3. Materials –school calendar

10:45 – 11:00 15-minute break

Facilitator Notes:

1. Ensure there are enough articles for each teacher for the next session.

11:00 – 12:15 ***Session 2: External Factors: Education and SES***

11:00 – 11:45 **Activity 2:** Participants will read the SES resource guide independently and then in table groups will come up with solutions to address these factors. The table groups will then share ideas to be scribed onto chart

paper. As a school team the staff will select solutions that can be implemented to support families this current school year.

Resource: http://www.apa.org/pi/ses/resources/publications/factsheet-cyf.aspx

Facilitator Notes:

1. Switch up table teams to gain different perspectives.
2. Materials –SES resource guide, chart paper, markers, and stickers for votes

11:45 – 12:15 **Activity 3:** Participants will reflect on the resource guide and plan out additional questions they would like to ask during home visits to gain more insight into family dynamics. Teachers will create learning profiles for students on their rosters.

Facilitator Notes:

1. Have teams write their home visit questions on a master chart before leaving for lunch.
2. Be sure to have teams share out and explain why they selected the new questions and how they related to the reading.
3. Materials –chart paper and markers

12:15 – 1:15 Lunch

Facilitator Notes:

1. Check the parking lot and ensure all paper materials are prepped

1:15 – 1:45 **Activity 2:** Participants will play a kahoot game, which is an online

question game based on all topics covered during the professional development series. The facilitator will click on the resource link to start the kahoot game and provide the teachers with the game pin code. Teachers join the game by going to https://kahoot.it and putting the game pin code into their cell phones to participate. There will be teacher prizes for the top 3 winners.

Resource:

https://play.kahoot.it/#/lobby?quizId=7571d7df-146e-46b9-9348-e9d4343b9a21

Facilitator Notes:

1. Ensure all teachers have cell phone access to play the game.
2. Be sure to have prizes ready for the winners. Try to find gifts that correlate to one main topic from each day.
3. Materials –kahoot game and teacher prizes

1:45 – 2:30 **Work Time:** Participants will have collaborative work time to plan their first math unit applying all the skills they have learned over the 3-day professional development series.

Facilitator Notes:

1. Prep graphic organizer for teachers to record the strategies they plan to use.
2. Ensure there are enough accessibility files for each teacher.

3. Materials –graphic organizer, extra accessibility handouts, math standards/units

2:30 – 3:00 **Close Out: Teacher Reflection Time**

Participants will fill out a summative survey monkey survey about the professional development series. They will also fill out thank you note cards for a fellow teammate who supported them over the three days or pushed their thinking.

Facilitator Notes:

1. Be sure to thank the staff for their participation and leave your email for follow-up support or questions.
2. Provide premade thank you note cards printed on colored paper.
3. Materials –survey and note cards

Differentiation PowerPoint Presentation

Guiding Struggling Math Students Towards Success

Day 1: Differentiation

Supporting All Learners

Quote

"If a child can't learn the way we teach, maybe we should teach the way they learn."

~Ignacio Estrada

Learning Outcomes

Teachers will learn…

- What differentiation is and how to use it in your everyday classrooms.
- How to create differentiated lesson plans to support struggling students.

The Differentiation Puzzle

What is Differentiation?

- Focuses on who we teach, where we teach, and how we teach.
- The primary goal is to ensure that teachers focus on processes and procedures that ensure effective learning for varied individuals.
- Key areas are content, process, product, and learning environment.

Tomlinson, C., & McTighe, J. (2006). Integrating differentiated instruction and understanding by design.

Differentiation: Content

- Differentiation of Content = what the students need to learn or how they will access the information
- Examples
  - Using math vocabulary cards
  - Presenting ideas through auditory and visual ways
  - Re-teaching an idea in small groups or extend skills for advanced learners

Tomlinson, C. (2000). Differentiation of instruction in the elementary grades.

Differentiation: Process

- Differentiation of Process = activities the students engages in to make sense of the content in order to master it
- Examples
  - Using tiered math activities with a variety of complexity
  - Offering manipulatives and hands-on-supports
  - Providing interest math centers to explore topics

Tomlinson, C. (2000). Differentiation of instruction in the elementary grades.

Differentiation: Products

- Differentiation of Products = culminating projects that ask the students to apply or extend what they have learned
- Examples
  - Giving students options of how to express what they have learned
  - Allowing students to work alone or in small groups
  - Encouraging students to create their own product assignments

Tomlinson, C. (2000). Differentiation of instruction in the elementary grades.

Differentiation: Learning Environment

- Differentiation of the Learning Environment = the way classroom works and feels
- Examples
  - Making sure there are places in the room to work quietly without distractions
  - Providing materials that reflect different cultures and home settings
  - Developing routines that allow students to get help when the teacher is busy

Tomlinson, C. (2000). Differentiation of instruction in the elementary grades.

Key Questions for Lesson Planning

- What do you want students to learn?
- Where will learning take place?
- How will you get them to learn it?
- What the product or results of the students' interactions will be?

Brighton, C., & Wiley, K. (2012). Analyzing pull-out programs.

References

- Brighton, C., & Wiley, K. (2012). Analyzing pull-out programs. *Fundamentals of Gifted Education: Considering Multiple Perspectives*. 188.
- Tomlinson, C. (2000). Differentiation of instruction in the elementary grades. Retrieved from http://education.ky.gov
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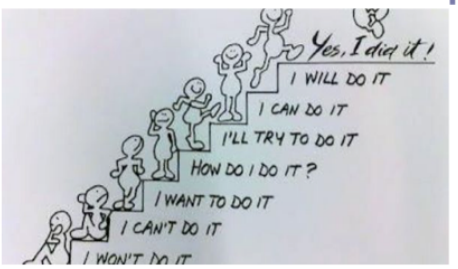
Student Motivation PowerPoint Presentation

Day 2: Student Motivation

Making Math Fun

Picture Reflection



Learning Outcomes

Teachers will learn…

- About the concept of student motivation in math.
- How to engage students with fun math motivation tools.

What is Student Motivation?

- Wang et al. (2015) defines math motivation as the extent to which individuals embrace math challenges, value the importance of math abilities, and are motivated to perform well in math.

Five Motivation Variables

1. Focus on learning and understanding mathematics concepts as well as on getting the right answers
2. Enjoyment in engaging in mathematics activities
3. Related positive (or negative) feelings about mathematics
4. Willingness to take risks and to approach challenging tasks
5. Self-confidence as mathematics learners

Waege, K. (2010). Motivation for learning mathematics in terms of needs and goals.

Tip #1

- Build on skills students have mastered
  - Students become comfortable and feel sense of accomplishment

Tip #2

- Demonstrate the usefulness for math in the real world
  - Students need help making the connection that the tools they use everyday are related to math

Tip #3

- Set achievable goals
  - Set small goals and as students achieve them they will be motivated to strive for more

Tip #4

- Present a reasonable challenge
  - Find something within their reach and peaks their excitement to motivate them with a love for math

Tip #5

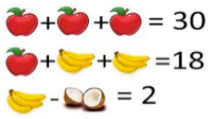
- Incorporate technology
  - Students love technology and there are apps that can support struggling students engage in a fun way

Tip #6

- Be enthusiastic while presenting math
  - Students attach value to math when they see their teacher's enthusiasm or parent values it

Tip #7

- Entice students with a magical math problem
  - Giving students a mystifying problem might get them hooked



Tip #8

- Play games
  - Using puzzles, board games, and manipulatives help make math interesting

Tip #9

- Incorporate music into your lessons
  - Using music helps latch students unto lessons

References

- Cox, J. (2016). How to motivate students to love math. Retrieved from http://www.teachhub.com/how-motivate-students-love-math
- Waege, K. (2010). Motivation for learning mathematics in terms of needs and goals. Retrieved from www.inrp.fr/editions/cerme6
- Wang, Z., Lukowski, S., Hart, A., Lyons, I., Thompson, L., Kovas, Y., Mazzocoo, M., Plomin, R., & Petrill, S. (2015). Is math anxiety always bad for math learning? The role of math motivation. *Psychological Science*, 26(12), 1863-1876.

Formative Professional Development Evaluation

Workshop: "Guiding Struggling Math Students Toward Success"
Facilitator(s): _____

What grade do you teach? (Circle one.)
Kinder 1st 2nd 3rd 4th 5th

If you are not a teacher, what is your job title at your school? _____

Read each statement below and check the appropriate number indicating to what level you agree or disagree (4 Agree and 1 Disagree).

	4 - Agree	3 - Somewhat Agree	2 - Somewhat Disagree	1 - Disagree
The professional development:				
1. was of quality.				
2. was relevant to my needs.				
3. format and structure facilitated my learning.				
4. enhanced my understanding of how to use differentiation in my classroom.				
5. enhanced my understanding of how to use explicit instruction in my classroom.				
6. enhanced my understanding of how to motivate my math students.				
7. enhanced my understanding of how to plan accessibility tools to enhance my math instruction.				
8. enhanced my understanding of how to address external factors such as parental support and other issues facing low-SES students.				
9. was the appropriate length.				
10. should be recommended to other early childhood staff.				

How will you use what you have learned?

Appendix B: Permission to Conduct Research

Letter Requesting Permission to Conduct Research

Date

Dear Chief Academic Officer,

I am currently a student working on obtaining my Educational Doctorate Degree with a Specialization in Teacher Leadership at Walden University. The project study is entitled "Effective Instructional Strategies to Support Struggling Math Students". I would like your permission to have the teachers in grades 2-5 participation in my study. The purpose of this study is to examine educators' perceptions regarding the efforts to improve students' math achievement in grades 2-5. The answers from the research questions will help to determine a project needed to augment teachers' math instruction to improve students' math skills. Individuals' participation will be voluntary, confidential, anonymous, and at their own discretion.

Participation will include:

- Open-ended video recorded interviews with the researcher.
- The plan is to interview each participant after school for approximately 30 minutes, the time may last longer depending upon any additional comments, or information participants may be willing to contribute regarding answers to questions.
- Each participant will receive a copy of his or her interview to check for accuracy.

Your permission will allow me to obtain a letter of data collection and letter of consent from each participant who agrees to participate in the study. Teachers' participation in the study is voluntary and may refuse to participate or withdraw from the study at any time.

Sincerely,

Tianay Perrault
tianay.perrault@waldenu.edu
1-800-925-3368

Appendix C: Interview Guide

Interview Questions

1. Do you enjoy teaching math? Explain.
2. Describe a typical math lesson for your class.
3. What approach do you use to teach math?
4. What resources do you use to teach math?
5. Describe how you approach supporting struggling students in math?
6. What strategies work best to support struggling low-SES students in your class?
7. Which strategies are not successful in supporting struggling students from low-SES backgrounds?
8. What factors affect student achievement for low-SES students in your classroom?
9. Describe the district and campus professional development you received to teach the math CCSS.
10. Do you feel the professional development you received adequately prepared you to teach the math CCSS?
11. What was your experience like learning math in elementary school?
12. Is there anything else you would like to share on this topic?